

AUTOMOTIVE and AVIATION MANUFACTURING ENGINEERING • PRODUCTION • MANAGEMENT

JANUARY 1, 1957

In This Issue

Design and Operation of the Turboglide Transmission More Automatic Equipment for 1957 Buick Production Advanced Material Handling at Parts Maker's Plant Power Steering Used on the Fordson Major Tractor Machining of Airframes for Planes of the Future Latest Construction Equipment at 1957 Road Show

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Bit manufacturer bites off 20% production increase

SUPERLA Soluble Oil plus technical service add up to improved product output at Chicago Brunner & Lay Rok-Bit Corp.

Superla Soluble Oil, which is now being used by Chicago Brunner & Lay Rok-Bit Corp., has solved a lot of milling machine operating problems for the Company. Soluble oils formerly used separated out of emulsion and turned rancid in use. Oil circulating lines plugged repeatedly. The plant's production rate was not up to capacity because of frequent shutdowns for cleaning of machines and for unplugging of oil lines.

On the advice of Joe Grigas, Standard Oil industrial lubrication specialist, the Company cleaned the machines, then converted them to SUPERLA at a 10:1 dilution.

This is how the change-over worked out. Production was increased 20%. Machine down time was substantially reduced. The Company was sufficiently pleased with the performance of Superla Soluble Oil in milling machines to convert two grinding machines to this oil. Results obtained on the grinding machines: excellent wheel life, good finish and rust protection.

SUPERLA Soluble Oil emulsifies readily with all types of water. It is a stable oil and forms stable emulsions. It does not tend to develop objectionable odors in use nor is it injurious to men, work or machines. SUPERLA Soluble Oil gives good tool life and prevents rust.

Get the facts about SUPERLA Soluble Oil. Your Standard Oil industrial lubrication specialist has them. In any of the 15 Midwest or Rocky Mountain states, one of these lubrication specialists is nearby. Call the one nearest you. Or write Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.



George P. Gaunt (right) shop superintendent shows rock bit to Joseph D. Grigas, Standard Oil industrial lubrication specialist. Joe is well qualified to assist customers. He has 13 years' experience in such work, has a degree in engineering from Illinois Institute of Technology and is a graduate of the Standard Oil Sales Engineering School.

Quick facts about SUPERLA Soluble Oil

- Emulsifies readily
- Forms stable emulsion
- Doesn't turn rancid
- Economical. Requires low emulsion concentrations
- Prevents rusting
- Non-injurious to men, machines, work
- Gives good tool life



STANDARD OIL COMPANY

(Indiana)

On big equipment...

to balance high engine speeds—



Reducing high auxiliary engine speeds to those best suited for snow plows is a typical Cotta job. Why? First... because Cotta heavy-duty Reduction Units are low in cost, ordered in large or small quantity lots. Second... maintenance is low, too, because they're built to withstand heavy, intermittent shock loads... give dependable performance on grueling, 'round-the-clock work schedules — indoors or out. And third...

because Cotta Reduction Units are precision-engineered and skillfully assembled by *specialists* with long experience and *know-how* in heavy-duty power transmission work.

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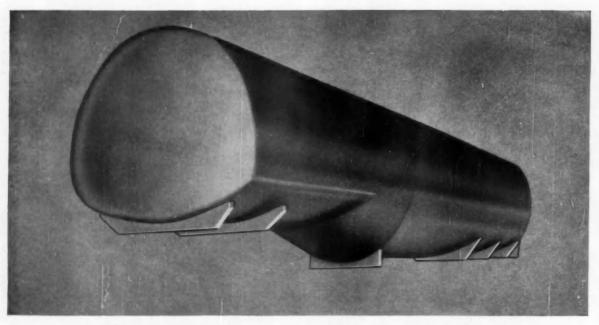
Sent free on request — diagrams, capacity tables, dimensions, and complete specifications. State your problem — COTTA engineers will help you select the right unit for best performance. Write today.

COTTA TRANSMISSION CO., ROCKFORD, ILLINOIS



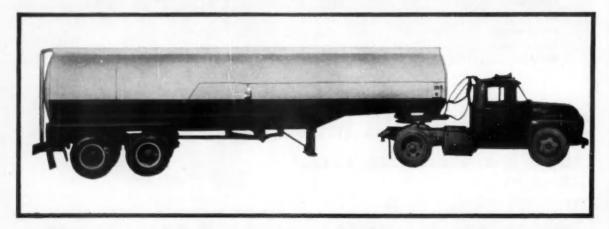
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Nickel-Copper high strength low alloy steel helps Butler Manufacturing Company,

Kansas City, Mo., increase capacity of frameless unit . . . enabling transport to haul . . .



2000 lb more payload without changing total weight

Without increasing axle load, increased revenue per ton mile is made practical by use of high strength low alloy steels containing nickel.

Steels of this type show 50,000 psi minimum yield point, or about 1½ times that of the usual carbon grade. This, together with improved corrosion resistance, allows use of thinner sections and permits following

either of these two procedures:

- (1) Reduce weight...saving tires, brakes and fuel...without reducing strength of equipment.
- (2) Increase payload capacity without increasing total weight or power demands.

Send for a copy of "Nickel-Copper High Strength Low Alloy Steels."



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JANUARY I. 1957 VOL. 116, NO. 1

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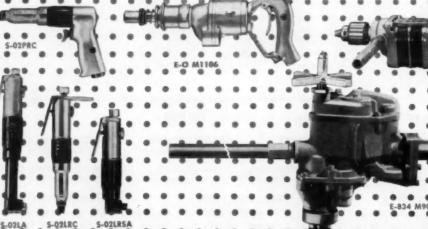
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AIR-POWERED REVERSIBLE NON-REVERSIBLE

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Write for Bulletin 53 giving specifications on these assembly tools and on the complete line of Rotor Tools for all industry. The ROTOR TOOL Company, Cleveland 32, Ohio.

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If you have any part in choosing the equipment or methods of applying heat to metal it makes sense to talk it over with Lindberg. The safest way to be sure that you have the right answer for any application of heat to industry is to consult the most widely experienced experts you can find. We believe we have them here at Lindberg. Our business is concerned only with the development of industrial heating equipment and we manufacture the most complete line in the field; heat treating furnaces, melting furnaces, high-frequency induction units, ceramic kilns; big ones, small ones, electric or fuel-fired, built in our plant or field-erected.

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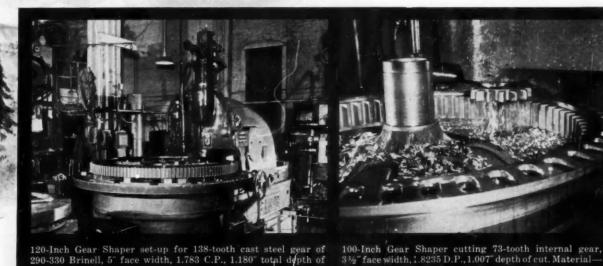
Lorain Moto-Cranes* combine speed, power and versatility available in a range of lifting capacities from 7 to 75 tons. Multiple speed transmission, multiple big tires provide exceptional off-road mobility.

THE PRECISION LINE

Fellows

*Reg. U.S. Pat. Off.

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These two Gear Shapers are designed to take heavy cuts at coarse feeds on spur or helical gears. Capacities: 28" to 100" for externals and 46" to 100" for internals on the 100-Inch; 28" to 120" for externals and 46" to 120" for internals on the 120-Inch. Maximum face width on each is 8".

For full information about the complete Precision Line of cost-cutting Fellows Gear Production Equipment get in touch with your Fellows representative.

Write, wire or phone any Fellows office.

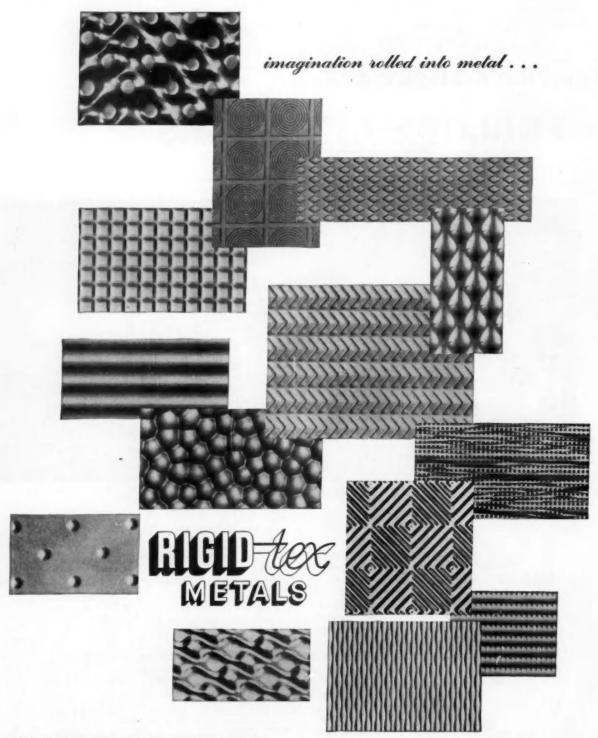
Gear Production Equipment

cut. Four cuts-1181 min. approx.

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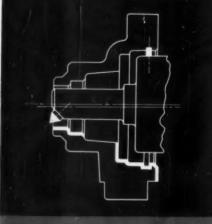
Ask for your copy of the Danly "Press Catalog." It gives the whole story on how Danly Presses are built for you. Write today.



DANLY



Showing parts mounted in the chuck. Without chuck changes, any of three parts having different exterior forms but identical interior contours can be accommodated.



12 operations are performed in one machine cycle. Heavy lines denote surfaces machined.

Intricate contouring is fast, accurate-

12 operations in one cycle!

Direct cam action—no levers—provides Ex-Cell-O Precision Boring Machines with accuracy, versatility and speed in difficult contouring operations.

In the application shown here—contouring an internal form in die-cast aluminum end covers—limits on diameters are held as close as plus or minus .0005 inch, and three work pieces are completed at a time. 12 separate operations are performed in one machine cycle, including precision boring, facing, chamfering and grooving.

Cams can be changed in minutes. Cam assembly swings out for quick, easy change. All motors are outside the base.

Another Ex-Cell-O feature is the large chip chute, cast as an integral part of the base. There are no openings where chips or coolant can enter the base. Contact your Ex-Cell-O representative or write direct for complete information.

EX-CELL-O CORPORATION

DETROIT 32, MICHIGAN

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At loft: The

Cell-O Styled 312
Cam Operated Precision Boring Machine. A smaller
model, the ExCell-O Style 308, is
also available because of the demand for this type
of machine.

EX-CELL-D



JOIN WITH HANDY & HARMAN SILVER BRAZING FOR PERMANENT PROFIT



Joint area is hand-fluxed with HANDY FLUX after which ½" piece of ½6" EASY-FLO 45 wire is placed on top of joint area. Alloy cost is one half cent per joint.



Assemblies are placed between resistance-heating electrodes which serve also as a jig. Operator applies current with foot pedal. Melted EASY-FLO 45 penetrates joint area quickly and easily. Assemblies are then given rapid quench to preserve hardness of cross-slide and to remove HANDY FLUX easily. Time required for complete cycle: 22 seconds. This lady brazes from 1200 to 1500 assemblies per day.

GET THE FACTS OF EASY-FLO

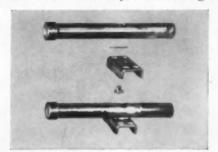
BULLETIN 20 tells you why high strength, speed and economy are inherent in EASY-FLO brazing. Also gives Handy information about joint design and fast brazing methods. We'll be pleased to send you a copy.

EASY-FLO 45 Solves Problems of Strain and Abuse

In this case, the strain and abuse are centered on the cross-slide joint of a bayonet power saw drive shaft. Made by Wen Products, Inc., Chicago, Illinois, for the do-it-yourselfer as well as the professional, this powerful tool operates at 2650 load strokes per minute and is expected to stand up to considerable strain and abuse throughout its lifetime.

The problem to be permanently solved was that of joining the steel cross-slide piece (.005 case hardened) to the drive shaft. The solution . . . silver brazing with EASY-FLO 45. A simple silver brazed joint assures all the strength this part will ever need. And the people at Wen Products were sure of it when they tested the part in this manner: After brazing, it was placed in a vise and the cross-slide piece was struck at right angles with a hammer. It was completely mangled before it was torn from the shaft. Thousands of these saws are in use today and there is no record of this joint ever having tailed in service. That says a lot for silver alloy brazing . . with EASY-FLO 45.

One of the beauties of silver alloy brazing is that it can join a wide variety of metals with the same excellent results and at remarkably low cost. Whatever you are making of metal, whether joints are in-



volved or not, it will pay you to investigate Easy-Flo brazing. We will be glad to explain the benefits of simplified design made possible by modern silver brazing techniques—and how these advantages can be profitably applied to your production requirements. Just call us.





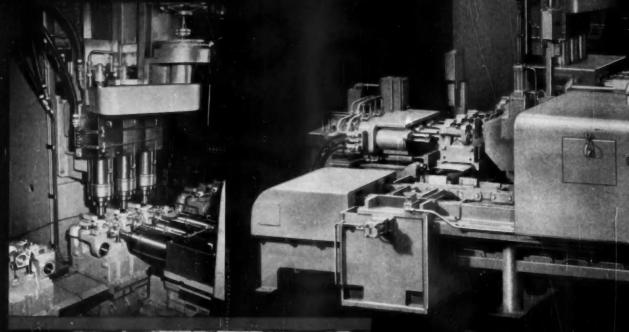
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Completely Machines Servo Valve Bodies for Automatic Transmissions

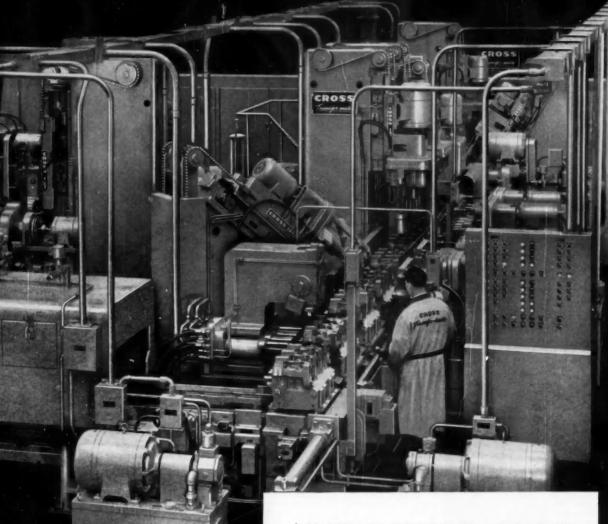
The final precision boring station.





The loading station. Part locations are checked automatically by Unit X to assure proper clamping.

Another Transfer-matic by Cross



* 21 drilling, 6 reaming, 5 tapping, 6 boring and 2 precision facing operations.

* 490 pieces per hour at 100% efficiency.

★ 25 stations—1 loading, 1 unloading, 9 drilling, 1 tapping, 2 rough boring, 2 precision boring, 2 precision facing, 1 washing and 6 visual inspection.

Palletized work holding fixtures (each fixture carries three parts).

Unloading unit for removing parts from fixtures and placing them on conveyor.

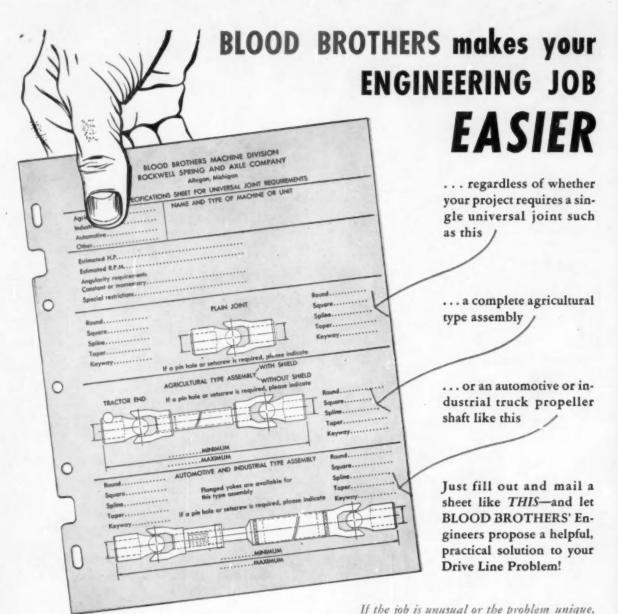
★ Complete interchangeability of all standard and special parts for easy maintenance.

 "Building Block" construction to provide flexibility for design changes.

Other features: automatic washing unit for fixtures; construction to JIC standards; hardened and ground ways; hydraulic feed and rapid traverse for milling, drilling and boring; individual lead screw feed for tapping.

Established 1898

First in Automation
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Blood Brothers' experience can be invaluable.

Many engineers are saving valuable time—right at the start of a project—by filling out and returning a "Spec Sheet" like this to Blood Brothers. Why not try it?

With your power transmission requirements in mind, our engineers will make recommendations and submit engineering drawings. You save designing and drafting time, and perhaps forestall problems, by having the initial teamwork of experienced specialists.

This service is offered without extra charge because we can work more efficiently with all the facts in hand.

Blood Brothers builds more standard types and sizes of universal joints than any other manufacturer (from 300 up to 89,300 torque inch pounds continuous load).

Why not use this experience on your next project? Write Blood Brothers today for your handy "Spec Sheets."

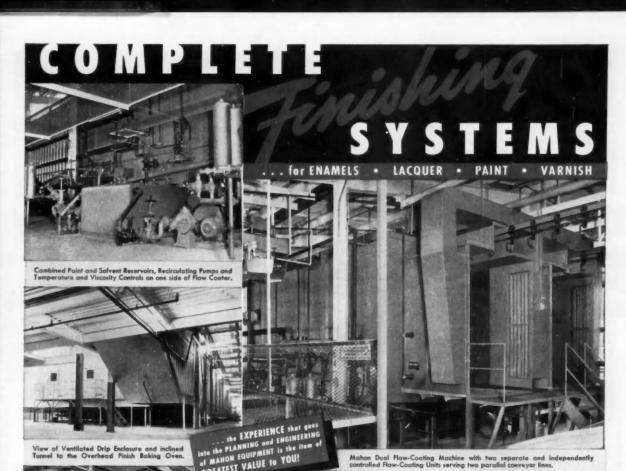


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ROCKWELL SPRING AND AXLE COMPANY

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UNIVERSAL JOINTS AND DRIVE LINE ASSEMBLIES



GREATEST VALUE to YOU!

View of Ventilated Drip Enclosure and inclined Tunnel to the Overhead Finish Baking Oven.

One of the Gas-Fired Heating Units with Automatic Tempera-ture Control Equipment below the Overhead Finish Baking Oven



General view of Mahon Air Supply and Exhaust Equipmen which provide Filtered Air and Ventilation for the entire system

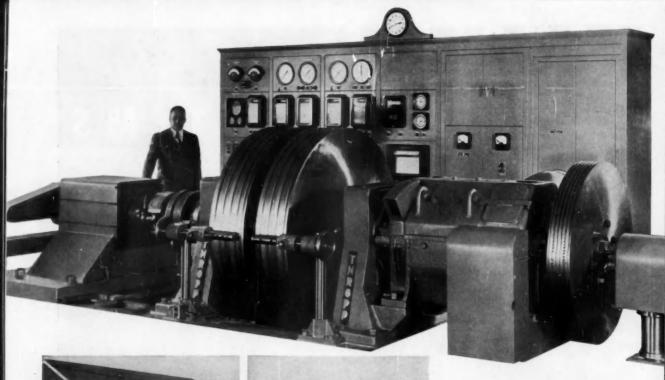
Dual Flow-Coating System CUTS Paint VOLUME, MANPOWER Requirements, and Operating COSTS!

Mahon Dual Flaw-Coating Machine with two separate and independently controlled Flow-Coating Units serving two parallel conveyor lines.

The new Flow-Coating System illustrated here has proved a tremendous saving in painting automobile hoods, fenders, fans and miscellaneous parts. The system has two parallel conveyor lines carrying parts through a dual Flow-Coating Machine—either side of which may be operated independently. Each section of the Flow-Coating Machine is served by a 450-gallon paint reservoir and a 450-gallon solvent reservoir and are fitted with automatic equipment to maintain constant paint viscosity and temperature. Other equipment in this system includes ventilated drip enclosures with sumps, scavenger pumps, and facilities for solvent flush-down, a finish baking oven and an air supply and exhaust system. This system now paints, on one line, all parts previously painted in two dip-coating systems which required an operating volume of 16,000 gallons of paint. One man operates and maintains the new Mahon System, where twelve men were required to operate and maintain the old equipment. The savings in material, labor and operating costs are obvious. If you have a finishing problem, it will pay you to discuss methods, equipment requirements and possible production layouts with Mahon engineers . . . you will find them better qualified to advise you, and better qualified to do the all-important planning, engineering and coordinating of equipment . . . and, if you care to investigate, you will also find that Mahon equipment will serve you better over a longer period of time. See Sweet's Plant Engineering File for information, or write for Catalog A-657.

THE R. C. MAHON COMPANY . Detroit 34, Michigan SALES-ENGINEERING OFFICES in DETROIT, NEW YORK and CHICAGO

Engineers and Manufacturers of Complete Finishing Systems—including Metal Cleaning, Pickling and Rust Proofing Equipment, Hydro-Filter Spray Booths, Dip and Flow Coaters, Filtered Air Supply Systems, Drying and Baking Ovens, Cooling Tunneth, Heat Treating and Quenching Equipment for Aluminum and Magnesium, and other Units of Special Production Equipment.







Huge dynamometer at R/M plant in Passaic, N.J. On this dynamometer, one of the world's largest, and most useful, the performance of friction materials in entire brake and clutch assemblies can be thoroughly tested.

R/M maintains a permanent testing station near Jennerstown, Pa., along U.S. Route 30, considered to be the most severe mountain course of its kind in the U.S.

HOW R/M SETS THE PACE IN FRICTION MATERIAL DEVELOPMENT

Lab and field testing solves problems you may be facing now

The one sure way to learn how friction materials will perform is to test them on a dynamometer or a vehicle. That's why Raybestos-Manhattan, world's leading maker of friction materials, has the world's most complete, most adaptable, testing facilities.

R/M laboratory testing equipment ranges from comparatively simple machines to giant inertia dynamometers, including one of the biggest ever

For road testing on both level and high mountain country, R/M has its own fleet of vehicles. At the well-known Jennerstown Mountain Testing Area, R/M maintains a year-round testing station where friction parts can be tried

and proven under the most rigorous driving conditions . . . on grades up to 15%.

Just what does this R/M testing mean to the O.E.M.? It means, first, that friction material performance in full-size brake and clutch assemblies can be thoroughly and precisely determined for you by R/M engineers. And second, perhaps even more important, it means that R/M has acquired a wealth of knowledge about friction material behavior that could solve problems you may be facing.

If you are working with friction materials, call in an R/M representative now. The facilities of R/M's seven great plants, with their research and testing labs, are as near as your telephone.



Write now for your free copy of R/M Bulletin No. 500. Its 44 pages are loaded with practical design and engineering data on all R/M friction materials.



THE TRADEMARK THAT SPELLS PROGRESS IN FRICTION MATERIAL DEVELOPMENT

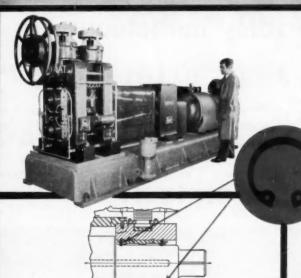
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7-inch Waldes Truarc retaining rings cut costs, speed assembly-disassembly of 2-high/4-high mill



In the assembly illustrated above, 7" Waldes Truarc (Series 5000) retaining rings—three on each roller—are used to position heavy-duty needle bearings in the bearing housing. Smaller rings position bearings in other roller assemblies and retain the shaft of a dual handwheel screwdown. All in all, 18 Waldes Truarc rings are used in the mill. They replace machined shoulders, spacers and lock nuts...eliminate costly threading, other machining operations.

New Model TA-625 2-high/4-high combination rolling mill designed by Stanat Manufacturing Co., Long Island City, N. Y., reduces 2½" ingot to precision-rolled strip as thin as .001".

Waldes Truarc retaining rings help make possible a complete change of work rolls in 20 minutes...solve difficult problems of accuracy control by achieving positive location of bearings to extremely close tolerances. Rings eliminate costly parts and machining, save space, reduce maintenance.



Assembly is simple, even with giant 7" diameter Truarc ring. Special Truarc ratchet pliers grasp the ring securely, ease it into the groove, snap it securely into position. Smaller pliers and various high-speed assembly jigs are available for other rings, permit assembly-disassembly to be performed rapidly even by unskilled labor.

Whatever you make, there's a Waldes Truarc Retaining Ring designed to improve your product... to save you material, machining and labor costs. Quick and easy to assemble and disassemble, they do a better job of holding parts together. Truarcrings are precision-engineered and precision-made, quality controlled from row material to finished ring.

36 functionally different types...as many as 97 differ-

ent sizes within a type...5 metal specifications and 14 different finishes. Truarc rings are available from 90 stocking points throughout the U.S.A. and Canada.

More than 30 engineering-minded factory representatives and 700 field men are available to you on call. Send us your blueprints today...let our Truarc engineers help you solve design, assembly and production problems...without obligation.

For precision internal grooving and undercutting...Waldes Truarc Grooving Tool!



TRUARC

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WALDES TRUARC Retaining Rings, Grooving Tools, Pilers, Applicators and Dispensers are protected by one or more of the following U. S. Patents: 2,382,948; 2,411,761; 2,416,852; 2,420,921; 2,428,341; 2,439,785; 2,441,846; 2,455,165; 2,483,379; 2,483,380; 2,483,383; 2,487,802; 2,487,803; 2,491,306; 2,491,310; 2,509,081; 2,544,631; 2,546,616; 2,547,263; 2,558,704; 2,574,034; 2,577,319; 2,595,787, and other U. S. Patents pending. Equal patent protection established in foreign countries.

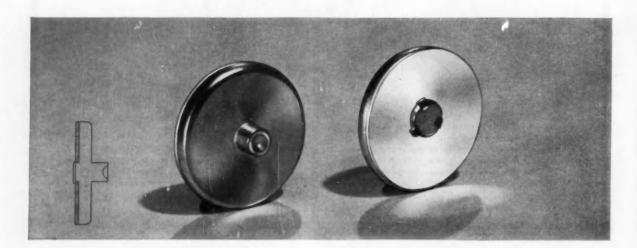
Mallory Contact Design Service Saved 40%

for an automotive relay manufacturer

A manufacturer of automotive-type relays required a contact disc for a new component. The original design called for a screw-machined blank one-half inch in diameter, with a silver alloy disc brazed to the base.

Investigation revealed the cost of the contact made in that manner would be beyond budget. Mallory contact engineers redesigned the contact to allow the assembly of a thin silver alloy facing on the base by crimping instead of brazing. A locating projection on the blank holds the contact disc in place.

Prices based on the Mallory method of contact assembly were submitted to the manufacturer. Evaluation proved the design acceptable—the cost analysis proved a 40% saving over the original design—the manufacturer was able to develop the relay product within its acceptable cost limits.



Five MALLORY keys to economy through contact engineering

- 1. The most effective contact material from the extensive line developed by Mallory. More economical alloys often can satisfy actual service conditions.
- 2. The most economical contact design ... for your purchasing, production and product needs.
- 3. The most economical backing material . . . from a group of Mallory alloys developed for this use.
- The most economical backing member design in relation to contact and product design requirements.
- 5. The most economical method of assembling contact and backing member.

By coordinating all these important elements of contact design, Mallory can help you put into effect a long-range plan for cutting contact cost and assuring peak performance.

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Serving Industry with These Products:

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How to make your automatic heat-treating and hardening even more automatic ...at no extra cost

FAST, continuous operation is the key to profitable automatic forging production lines. Especially in high speed heat-treating and hardening operations. They're extremely sensitive to changes in chemical composition and structure of steel used. Interruptions to make tests or adjustments slow production, increase costs, reduce the advantages of automatic operation. This makes the uniformity of the steel you use an even more vital factor. The more uniform the steel, the steadier the production and the greater the potential you can realize from your automatic equipment.

You can get the utmost in uniformity, and automatic operation—at no extra cost—by using Timken® fine alloy steel. Uniformity is constant from bar to bar, heat to heat, order to order.

We take many extra quality-control steps to assure this uniformity. For example, the Timken Company uses a magnetic stirrer for molten steel to assure equal distribution of alloys, uniform temperature and improved working of the slag. It's the first installation of its type in the United States.

To further assure uniformity, your order of Timken fine alloy steel is handled individually. We target our conditioning procedures to meet your end use requirements. Each bar is stamped to identify the heat it came from. This limits variations within an order as well as from order to order. And every heat is examined spectrometrically to insure uniform grain size.

To make your automatic heat-treating and hardening operations even *more* automatic—at no extra cost—always specify Timken fine alloy steel. You'll get money-saving performance and uniform results every time. The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

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TRACTOMOTIVE











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PAYLOADER'



SILENT HOIST







MECHANICS IS PROUD TO SERVE THE BLUE BOOK OF AMERICAN INDUSTRY From Drawing Board to Production



JOY

The trade marks on these pages represent some of the companies we have been privileged to serve recently. Working with them, and many others, from drawing board to final production, Mechanics engineers have accumulated a wide range of universal joint knowhow. They have solved power transmission and control problems such as clearance, torque, weight, angle, alignment, balance, overload, shock, speed changes, reversals and stamina with improved designs, metals, machining, tolerances, heat treating, hardening, balancing and lubrication. By designing and building drive lines that are specifically suited to the operating characteristics of each machine, Mechanics universal joint engineers have helped the engines in the products represented on these pages to deliver maximum power to the wheels. The drafting board stage is the time to design more efficient power transmission into your product. We invite you to benefit from Mechanics engineers' universal joint experience when planning your next model.

MECHANICS Universal Joint Division BORG-WARNER





























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The Butler Engineer

















































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980 LBS. OF EXTRA

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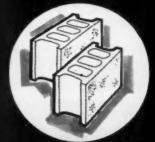
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Haul 21 more cases of can goods, per load!



Haul 10 more bags of potatoes, per load!

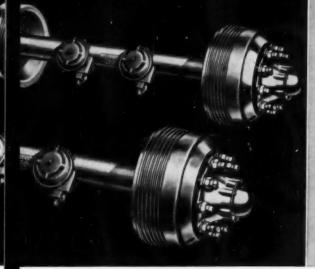


Haul 30 more cinder blocks, per load!

Figure your extra profit, in terms of additional ton-miles of payload!

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> TDA TK-500 Series Trailer Axles in Tandem



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USE THIS MONEY-SAVING
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WORLD'S LARGEST MANUFACTURER OF AXLES FOR TRUCKS, BUSSES AND TRAILERS

New LINDBERG-FISHER Autoladle

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"LITTLE JOE" provides these advantages:

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A Division of Lindberg Engineering Company, 2491 West Hubbard Street, Chicago 12, III.

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LONG LIFE PISTON

CAST IRON WEAR GROOVE G and E Wire theer of the pictor, and the stand of the st puts



- Low initial cost
- **Light** weight
- **★** Amazing increase in piston life
- **★** Maintains new engine power and performance

This Gillett & Eaton exclusive steel wire insert is cast This Gillett & Eaton exclusive steel wire insert is cast right into the alloy piston to make hard surfaces for the top ring groove. Here's an entirely new piston design combining all the advantages of aluminum alloy with the long life of steel wire bearing surfaces in the top ring groove. No noticeable increase in weight. G and E Wire Insert Pistons are real top performers at Low Cost—barely more than ordinary alloy pistons!

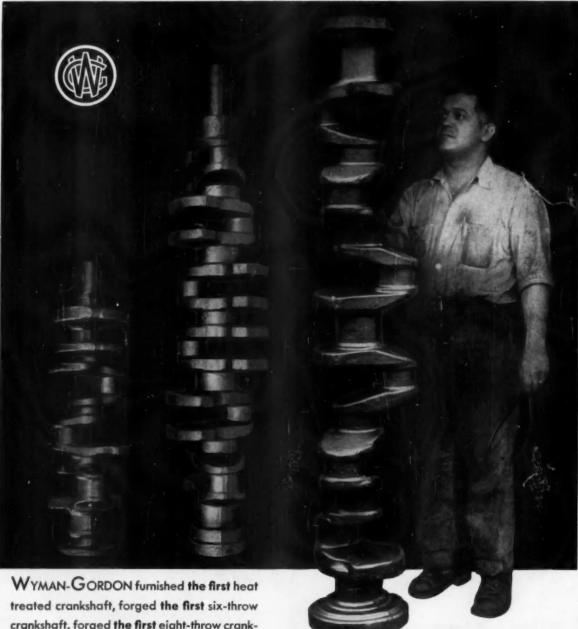
When the grooves are machined, the closely spaced steel wire inserts cast in the piston become hard bearing surfaces on top and bottom faces of the groove. The wire insert also strengthens the second ringland.

Engines fitted with Gillett & Eaton Wire Insert Pistons maintain new engine power and performance much longer because top ring groove wear is greatly reduced. Build extra volume and profits at Low Cost with Gillett & Eaton Wire Insert Pistons.

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WYMAN-GORDON furnished the first heat treated crankshaft, forged the first six-throw crankshaft, forged the first eight-throw crankshaft, forged the first crankshaft with integral counterweights, and today forges a larger quantity and a greater variety of crankshafts than any other company in the world.

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Crankshaft forgings illustrated, left to right, for V-8 passenger car, diesel truck and heavy tractor engines

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of multiple circuits

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A new highly versatile assembly unit that makes one operation out of many. Saves time, trouble, money.

Simplifies such operations as the connecting of wall switches to built-in ranges . . . top with bottom circuits in clothes washer . . . front and back assemblies to car electrical systems.

Uses quick, easy-to-apply Faston terminals. Can be used for as many as six individual circuits.

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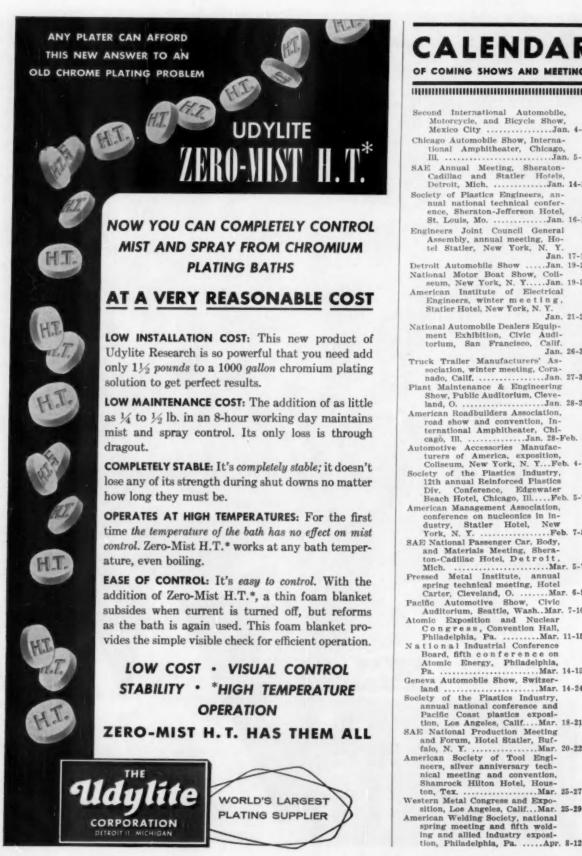
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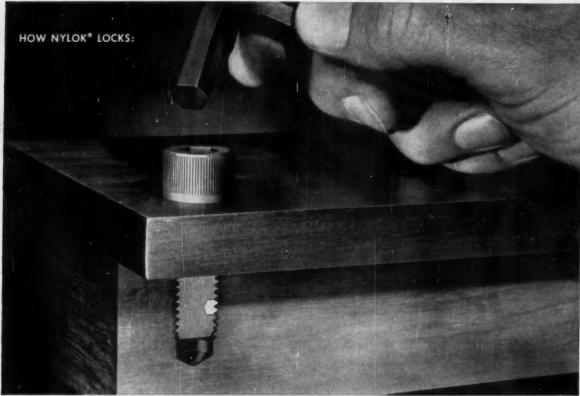
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CALENDAR

Second International Automobile,
Motorcycle, and Bicycle Show, Mexico CityJan. 4-1
Chicago Automobile Show, Interna-
Chicago Automobile Show, International Amphitheater, Chicago, IllJan. 5-1
SAL Annual Meeting Cheraton-
Cadillac and Statler Hotels, Detroit, MichJan. 14-1
Society of Plastics Engineers an-
ence, Sheraton-Jefferson Hotel,
nual national technical confer- ence, Sheraton-Jefferson Hotel, St. Louis, Mo
Assembly, annual meeting, Ho-
tel Statler, New York, N. Y. Jan. 17-18
Detroit Automobile ShowJan. 19-27
seum, New York, N. YJan. 19-27
American Institute of Electrical
Detroit Automobile ShowJan. 19-27 National Motor Boat Show, Coll- seum, New York, N. YJan. 19-27 American Institute of Electrical Engineers, winter meeting, Statler Hotel, New York, N. Y. Jan. 21-25 National Automobile Dealers Equip.
ment Exhibition, Civic Audi-
torium, San Francisco, Calif. Jan. 26-30
torium, San Francisco, Calif. Jan. 26-30 Truck Trailer Manufacturers' Association, winter meeting, Coranado, Calif. Jan. 27-30 Plant Maintenance & Engineering
nado, CalifJan. 27-30
land, U
road show and convention, In-
American Roadbuilders Association, road show and convention, International Amphitheater, Chicago, Ill
Automotive Accessories Manufac-
Coliseum, New York, N. YFeb. 4-7
12th annual Reinforced Plastics
Div. Conference, Edgewater Beach Hotel, Chicago, IllFeb. 5-7
American Management Association,
conference on nucleonics in in- dustry, Statler Hotel, New
York, N. YFeb. 7-8
conference on nucleonies in industry, Statler Hotel, New York, N. Y
MichMar. 5-7
Pressed Metal Institute, annual
spring technical meeting, Hotel Carter, Cleveland, OMar. 6-8 Pacific Automotive Show, Civic
Auditorium, Seattle, Wash. Mar. 7-10
Atomic Exposition and Nuclear
Congress, Convention Hall, Philadelphia, PaMar. 11-15 National Industrial Conference
Roard fifth conference on
Atomic Energy, Philadelphia,
Atomic Energy, Philadelphia, Pa. Mar. 14-15 Geneva Automobile Show, Switzer- land Mar. 14-24 Society of the Plastics Industry,
Society of the Plastics Industry,
annual national conference and
Pacific Coast plastics exposition, Los Angeles, CalifMar. 18-21
SAE National Production Meeting and Forum, Hotel Statler, Buf-
and Forum, Hotel Statler, Buffalo, N. Y
neers, silver anniversary tech-
nical meeting and convention, Shamrock Hilton Hotel, Hous-

tion, Philadelphia, Pa.Apr. 8-12



LOCKED! The tough, resilient nylon pellet keys itself into the mating threads. It forces threads together, and locks the screw securely.

NEW—a complete line of <u>self-locking</u> UNBRAKO socket screw products that won't work loose

They simplify design and save production time

Unbrako socket screws are now available embodying the Nylok* self-locking principle. Nylok provides a truly practical new solution to the problem of making screws self-locking.

You save production time when you build products with selflocking Unbrakos. And you get greater simplicity in design with less bulk and weight. The number of parts you must assemble to achieve full locking action is reduced to the absolute minimum. Lockwashers under screw heads are no longer necessary. Costly wiring of cross drilled heads is eliminated. So are cotter pins and complex multiple set screw installations. Self-Locking Unbrakos are completely reusable. They have uniform locking and installation torques—with no galling or seizing on mating threads. They successfully withstand temperatures from —70° to 250°F. And, on properly seated screws, the pellet acts as a liquid seal.

Self-locking Unbrako socket screws come in a complete range of standard sizes and materials. See your authorized industrial distributor. Technical data and specifications are detailed in Bulletin 2193. Write us for your copy today. Unbrako Socket Screw Division, STANDARD PRESSED STEEL Co., Jenkintown 53, Pa.

*T.M. Reg. U.S. Pat. Off., The Nylok Corporation

UNBRAKO SOCKET SCREW DIVISION

STANDARD PRESSED STEEL CO.



Socket head cap screws.



Socket shoulder screws.



Flat head socket screws



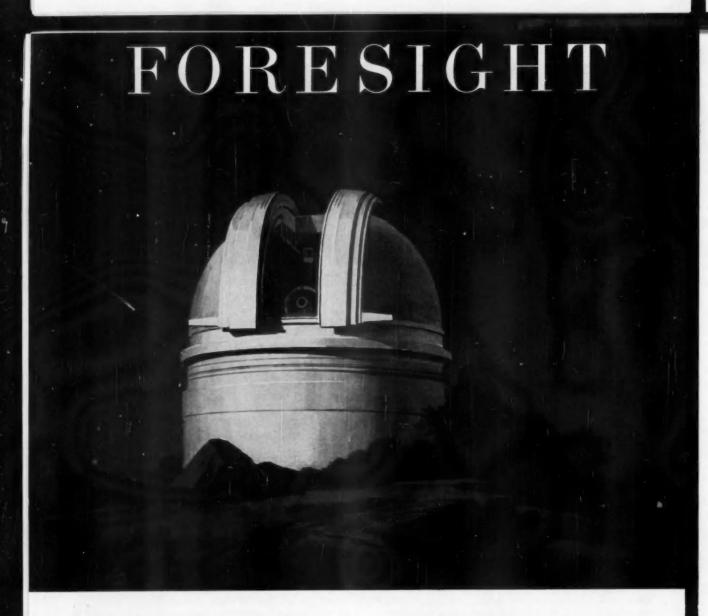
Button head socke



Socket pressure pluge. Standard sizes 1/4 to 1 1/4 in.



Socket set screws. All stand-



Planning for tomorrow • Producing for today!

Since the earliest days of the industry, Bendix foresight in product design and development has contributed materially to automotive progress,

For example, Bendix* power braking and power steering, two of the industry's most popular new car features, are the results of years of research and engineering by Bendix specialists in these important fields.

Today Bendix engineers are likewise busy planning

and developing new and better products to meet the needs of the years ahead.

It is because of this foresight the automotive industry looks to Bendix for components that continue to lead in public acceptance and dependable performance.

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Bondix Power Brokes



Bandix Pawer Steering





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High Spots of This Issue

* Advanced Material Handling at Parts Maker's Plant

Currently engaged in a plant-wide process improvement program is AC Spark Plug Div. of General Motors Corp. One of the most fertile areas for cost-cutting is material handling, and here is how AC is going about it. Page 48.

★ Latest Construction Equipment at 1957 Road Show

The stage is all set for the opening late this month of the biggest display of roadbuilding equipment ever assembled. Chicago's International Amphitheatre will be the site. A technical meeting will run concurrent with it. Page 52.

Annual Meeting of the AMSE

More than 300 technical papers were presented to some 8000 engineers in attendance at the recent 77th annual meeting of the American Society of Mechanical Engineers. Abstracts of several outstanding papers are given. Page 58.

More Automatic Equipment for 1957 Buick Production

Introduction of a new car model generally means new manufacturing techniques, and such is the case with Buick this year. Reviewed here is the large variety of new equipment and methods now being employed for the 1957 car. Page 64.

* Can Airframes of the Future be Machined?

Machine tool builders, always prepared to meet a challenge, have one today in fulfilling the need for close machine tolerances required by aircraft designers. What the demands are and how they may be answered are discussed. Page 68.

→ 37 New Products Items

And Other High Spots, Such As:

Chevrolet Turboglide; power steering on the Fordson tractor; Automobile Show displays; brainstorming; nickel-chromium alloy; and Chevrolet engineering center.

Complete Table of Contents, Page 3
Automotive and Aviation News, Page 33

PASSENGER CARS • TRUCKS • BUSES • AIRCRAFT • TRACTORS • ENGINES • BODIES • TRAILERS • ROAD MACHINERY • FARM MACHINERY • PARTS AND COMPONENTS • ACCESSORIES • PRODUCTION EQUIPMENT SERVICE EQUIPMENT • MAINTENANCE EQUIPMENT • PRODUCTION • MANAGEMENT

TWO CINCINNATIS

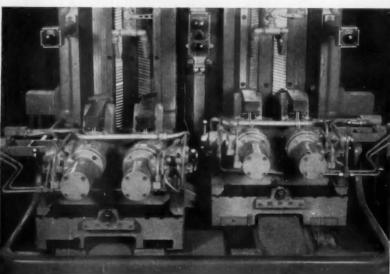
broach 134 SIZES of Tool Bits

in 65% Less Floor Space



Two tool bits clamped in position, as seen by the broaching cutters. The top relief will be broached on one of these blanks and the side relief on the other.





Doing more work in less floor space releases it for other productive equipment; reduces fixed cost. Two cincinnati® Hydro-Broach Machines save 65% of the floor space formerly required by the old equipment to machine 11 styles of tool bits in 134 sizes. These two Hydro-Broach machines. both of 10-ton capacity, were tooled up by Cincinnati broaching specialists with hydraulically operated, progressive type fixtures. All tool bits are broached complete from a common shape of blank.

This Cincinnati two-machine production team averages 800 completely broached parts per hour.

You may not be directly interested in the manufacture of tool bits, but you will be interested in what CINCINNATI Broaching Machines and Engineering Service can do to reduce your manufacturing costs (and perhaps fixed costs, too). May we hear from you? Meanwhile, you might want a copy of our latest Duplex Hydro-Broach catalog. Brief specs will be found in Sweet's.

> THE CINCINNATI MILLING MACHINE CO. CINCINNATI 9, OHIO

CINCING MACHINES - BROACHING MACHINES - CUTTER AND TOOL GRINDERS METAL FORMING MACHINES - HARDENING MACHINES - OPTICAL PROJECTION

PROFILE GRINDERS - CUTTING FLUID - GRINDING WHEELS

Reus of the AUTOMOTIVE AND AVIATION INDUSTRIES

Vol. 116, No. 1

January 1, 1957

Packard Production Rolls Again at South Bend Plant

Packard automobiles are rolling off the assembly lines once again after a lapse of about six months. Except for its name, the 1957 Packard Clipper model now being turned out at South Bend, Ind., retains only part of its individual identity.

For the first time in 53 years, the car is being built in a city other than Detroit. It also is leaving the luxury field which it once dominated and will be marketed in the medium price range.

With the exception of the grille and rear fenders, the car resembles the Studebaker, from which many components have been adopted under a cost-savings program. In addition, the Packard has many other components similar to the Studebaker line, including chassis, engine, and transmission. It is being built on the same line with Studebaker.

A production goal for Packard has not been given. The company recently, however, indicated it plans a combined output of 153,000 Packards, Studebakers, and trucks. When the Packard is introduced late this month, the corporation will have an estimated 2500 dealers authorized to handle sales and service, compared with 1200 at the beginning of 1956.

AMC Loss In Fiscal Year Placed At \$19.7 Million

American Motors Corp. had a net loss of \$19.7 million in the fiscal year ended Sept. 30. The figure was nearly three times more than the \$6.9 million loss it incurred in the previous year. Total sales dropped from \$441.1 million to \$408.4 million. The loss was after \$12.1 million in non-recurring profit realized from the sale of \$10.6 million of Ranco stock and tax credits totaling \$1.45 million.

JET ALLOYS ARE SOUGHT

The above robot-like objects are actually electric heat furnoces used in the development of new jet engine alloys by the Thomson Laboratory of General Electric Co. at Lynn, Mass. The 11 furnoces now have operating temperatures from room temperatures from room temperature to 1650 F. Samples of different metals and alloys in the form of bars are inserted in the core and subjected to varying stresses and temperatures for analysis.



Sharply reduced automobile sales were the chief factor contributing to the lower sales and profits. AMC's appliance operation, on the other hand, showed its best profit since 1950.

The corporation looks to the New Year with more confidence now that it has cut much of its operating costs. There is every expectation that operations will now draw closer to the break-even point.

Operating costs and budget for the Automotive Div. have been cut by \$23 million for 1957. They include \$15 million in unusual non-recurring costs and expenses incurred last year, and reduction in automotive selling, manufacturing, engineering, service, and administration expenses.

To break even in 1957, the corporation will have to sell 150,000 cars, about 30,000 more than in 1956. AMC continues to count heavily on the Rambler to achieve this goal.

Sales figures for the Rambler are not available yet, but production figures show the company built about 78,000 of the small cars through Dec. 8. Sales of all AMC cars for the January-October period totaled approximately 98,000 units.

Borg-Warner Plant in Brazil To Make Gears, Transmissions

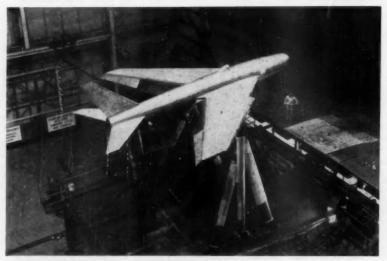
Borg-Warner International Corp. has completed arrangements with a Brazilian financial group to open a factory for the production of gears and transmissions in Sao Paulo. The new operation will be known as Borg and Beck do Brazil and will be financed on a 50-50 basis by the two parties.

Borg-Warner will supply machinery and other equipment for the plant. The Brazilian group will provide the land, and output is expected to get underway within a year.

Turnpike Cruiser Power Plant Offered in Other Mercury Cars

Mercury will offer a modified version of the 368 cu in. engine used in the Turnpike Cruiser as an option on other 1957 models at a suggested list price of \$633. Known as the M-335, the engine is designed to develop 335-hp. The drive train has been modified so that the engine can be used with a standard transmission.

MEWS of the AUTOMOTIVE



WIND TUNNEL FOR AIRCRAFT AND MISSILE RESEARCH

This swept-wing research model by the National Advisory Committee for Aeronautics is undergoing investigation in the new tull-scale wind tunnel at the Langley Aeronautical Laboratory. Purpose of the tests on the model, representative of present-day fighter aircraft, is to study the application of high-lift devices for improved low-speed performance. NACA scientists are using the model to study means of delaying separation of the boundary layer at the leading edge of the wing as well as at the trailing edge of the flaps to produce higher lift and thereby cut landing speeds.



HARPER DEVELOPS MAMMOTH CAR-BOTTOM FURNACE

This huge car-bottom furnace was recently placed in service by the Electronic Components Div. of Stackpole Carbon Co. Designed and built by Harper Electric Furnace Corp., the furnace has 160 au ft a loading space. It is being used for high temperature calcining of conductor material for fixed composition resistors. Designed for a maximum temperature of 2750 F, the furnace has a usable chamber four ft square and 10 ft in depth. It is heated by 1¾ in. diam Globar non-metallic resistance elements. The car itself is equipped with a pneumatically-operated rising sand seal. Is reised position, it seals the car and the furnace to prevent air filtration.

GM To Spend \$10 Million On Brazilian Expansion

General Motors will invest \$10 million in its Brazilian subsidiary, General Motors do Brasil S. A., to expand truck manufacturing operations. Included is a new plant for producing trucks similar to the Chevrolet. Also planned are a modern foundry for six-cylinder engine blocks and other gray iron and malleable castings, and an engine manufacturing plant.

The site of the new manufacturing operations is a 420-acre plot at Sao Jose Campos, about 60 miles from Sao Paulo, site of the existing Brazilian plant. The Sao Paulo plant will continue its operations.

Volume production on the engines at the new plant is expected to get underway at the end of 1958. The engines will be used in a truck with a gross vehicle weight of 18,000 lb.

Plymouth Station Wagon Prices Up \$95 to \$164

Plymouth has increased prices on its station wagons \$95 to \$164 above comparable 1956 models. Many items, formerly optional, become standard equipment on certain 1957 models.

The 1957 price range from \$2105 for the deluxe two-door, six-passenger model with the six-cylinder engine to \$2613 for the sport four-door, nine-passenger V-8 model. The new models are built on a 122-in. wheelbase, seven in. longer than their 1956 counterparts.

Six-Cylinder Series	1956	1957
DeLuxe Two-Door (Six Pass.) Custom Two-Door (Six	\$2,007	\$2,10
Pass.)	2,073	2,207
Pass.) Custom Four-Door (Nine	2,116	2,257
Pass.) Sport Four-Door (Six	2,237	2,401
Pass.)	2,274	2,376
Sport Four-Door (Nine Pass.)	2,395	2,520
Eight-Cylinder Series		
DeLuxe Two-Door (Six Pass.)	2,103	2,198
Custom Two-Door (Six Pass.) Custom Four-Door (Six	2,169	2,300
Pass.)	2,212	2,350
Pass.)	2,333	2,494
Sport Four-Door (Six Pass.)	2,370	2,469
Sport Four-Door (Nine Pass.)	2,491	2,613
* Suggested list prices eral excise, state, and delivery and handling ch	local taxes,	

AND AVIATION INDUSTRIES

Chrysler Plant in Delaware to Build Dodge and Plymouth

Chrysler Corp.'s News k, Del., plant may play as important a part in the corporation's East Coast operations as does the Los Angeles assembly plant in its West Coast market. A sound indication is the announcement that Dodge cars will be assembled at the Delaware plant in addition to Plymouths.

Original plans were to build Plymouths only. The orporation has now decided to add a Dodge assembly line after Plymouth output gets rolling there.

It is possible that the plant may eventually turn out all Chrysler lines for the Eastern market. The corporation is planning a sizeable expansion at the one million sq ft facility.

Plymouth output at the plant is scheduled to start about mid-year. Chrysler's Los Angeles plant is now turning out all car lines, with the exception of Imperials.

Ford Gift to University Includes Founder's Home

The automobile industry's continued interest in and aid to higher education is evident in the announcement that Ford Motor Co. and the Ford Fund have offered the Univ. of Michigan gifts of 210 acres of land in Dearborn and \$6.5 million in cash. The grants are to establish a Dearborn campus of the university to be known as Dearborn Center.

The gifts include the palatial Fair Lane, home of the late Mr. and Mrs. Henry Ford. Since their deaths the home has housed the Ford Motor Co. archives. The collection includes more than eight million documents, mostly personal papers of Henry Ford.

UAW Readies Its Demands for Negotiations in '58

Undoubtedly, 1958 will go down in nutomotive annals as another historical year in union-management relations. Not altogether happy about the union's accomplishments last year, including the Supplemental Unemployment Benefit plan, UAW President Walter Reuther already has an-



PLYMOUTH FURY AND PONTIAC BONNEVILLE MODELS

Two new models introduced by Plymouth and Pontiac, respectively, at the National Automobile Show in New York last month are the Fury (top) and the Bonneville sports convertible. The farmer is powered by a 290-hp engine with a displacement of 318 cu in. and a 9.25 to 1 compression ratio. Fuel injection V-8 engine in the Pontiac Bonneville delivers over 300 hp and will be offered soon in limited volume.

nounced some of his intentions for next year.

How much greater the demands will be than those asked in 1956 is beyond speculation at this point. Many of them certainly will be made known in the coming months as Reuther begins to direct his 1.5 million member union toward new goals.

(Turn page, please)

MODEL CHANGEOVERS ACCOUNT FOR SEPTEMBER FALL 1956 New Passenger Car Registrations*

Arranged by Makes in Descending Order According to the 1956 Nine Months' Totals

NINE MONTHS

				U	nits	Per Cent of Total	
MAKE	September 1956	August 1956		1956	1955	1956	1955
Chevrolet	116,519	145,680	164,768	1,209,038	1,220,094	26.21	22.32
ord	87,282	131,769	137,089	1,010,736	1,168,850	21.91	21.38
luick	40,604	51,404	70,030	431,130	585,650	9.35	10.71
lymouth	31,117	44.978	56,538	377,632	515,569	8.19	9.43
Oldsmobile	32,148	41,852	57,760	350,495	454,973	7.60	8.32
ontiac	25.310	34,318	48,291	282,559	407,957	6.13	7.46
Aercury	21.860	28.520	33,320	219,223	281,286	4.75	5.14
lodge	15,400	21.568	24,716	170,731	217.815	3.70	3.96
adillac	10,903	13.517	11.267	109,910	108.571	2.38	1.90
hrysler	8.325	11.623	11,981	93,748	123,313	2.03	2.25
le Soto		9.423	8.726	79,005	92,133	1.71	1.68
lash	6.007	7.749	7.997	63.656	74.327	1,38	1.30
tudebaker	4.742	6,950	7,466	62,384	76,685	1.35	1.40
incein	2.819	4,483	2.682	33,225	24,084	.72	. 44
ludaon	2.084	2,689	3.278	26,226	35,243	.57	. 64
ackard	1,837	2,960	4,087	25,392	40,085	.55	.71
continental	87	127	*****	1,265	******	.03	*****
Alac. Demestic	217	439	419	2.942	6,748	.06	.12
oreign	6,800	8,273	4,119	63,530	35,745	1.38	.60
Total-All Makes.	421,021	568,320	654,532	4,812,825	5,460,128	100.00	100.00

Mews of the AUTOMOTIVE

One goal already made clear by Reuther will be the biggest pay raise in history. The union already is girding itself for any eventuality. One action is a proposal to raise monthly union dues from \$2.50 to \$3.00 to build up a fund for a possible strike. In addition to increased wages, other economic concessions certainly will be asked of the automobile, aircraft and farm implement industries.

There will also be a strong attempt to organize industry's "white-collar" workers, which the union has been trying to do unsuccessfully for years. Admittedly, some of these have fallen into union ranks, but the number has been small.

Automobile companies certainly are not looking toward 1958 with relish. There is no question, however, that they also are planning their own proposals and counter-proposals which they hope to use to arrive at a common meeting ground with the UAW to achieve continued industrial peace.

GM Car Prices Are Increased Under New Advertising Policy

A change in advertising policy was put into effect recently by General Motors. It is another of several contractual concessions granted to car dealers by the corporation within the last year to improve factory-dealer relations.

Under the new program, GM will assume full responsibility for the cost and administration of the advertising fund on both national and local levels. In the past dealers contributed varying amounts into the fund. The dealer contributions are said to-have totaled \$90 million annually.

As a result of the new program, list prices on all GM cars have been increased from about \$28 on the Chevrolet to \$92 on the Cadillac line. The actual retail price, however, is not expected to go up that much. Most dealers previously added the advertising charge to the retail price.

The excise tax and the customary markup on the higher wholesale price will add about \$8 to the price of a Chevrolet. Dealers who feel they are entitled to their full traditional discount undoubtedly will pass the markup and tax on to the customer. Others will absorb part or all of the increase under the stress of competition.

1956 WEEKLY U. S. MOTOR VEHICLE PRODUCTION

As reported by the Automobile Manufacturers Association

		Jan. 1 to			
Make	Dec. 15	Dec. 8	Dec. 1	Nov. 24	Dec. 15, 195
PA	SSENGER	CAR PR	ODUCTION		
Hudson	140	110	102		22,301
Nash	464	381	545	0	54.117
Rambler	2,554	2,098	1,906	0	23,254
Total—American Motors	3,158	2,589	2,553	0	99,672
Chrysler and Imperial	3.750	3,681	3,266	2,166	101,470
De Sote	3,566	3,727	3,416	2,683 4,335	98,085 194,019
Dodge	7,092 15,000	8.262 15.288	7,576 14,498	10,169	430,418
Total - Chrysler Corp.	29,408	30,958	28,754	19,333	823,992
	41.351	40,898	40.313	32,257	1,305,623
Lincoln and Continental	1.230	1.250	1.064	820	46,888
Mercury	7,265	7,203	6,266	5,281	233.634
Total—Ford Motor Co	49,846	49,351	47,643	38,358	1,586,125
Buick	14,490	15.097	13,949	9,456	511,305
Cadillac	4,337	3,815	3,289	2,329	133,544
Chevrolet	37,648 10,997	41.552 12.251	41,173 11,218	31,733 8,606	1,563,751 415,338
Oldsmobile	8,181	9,423	9,313	7,198	321,182
Total—General Motors Corp	73,653	82,738	78,942	59,324	2,945,120
Packard	0	0	0	0	13,289
Studebaker	2,493	1,766	1,820	1.433	79,148
Tetal StudePack. Corp Checker Cab	2,493	1,786	1,820	1,433	92,437
Total Passenger Cars	158.641	167.576	159.807	118,470	5,551,246
total tastenga earstitititi				*******	0,000,000
how the halo		PRODUC			200
Available	7	5	6	5	352
Chevrolet	9,729	7,681	7,823	5,373	340,663
3. M. G	1,727	1,761	1,940	1,155	87,250
Diamond T	84	85	77	64	4,947
Nvoo	80	80	80	48	3,449
Oodge and Farge	2,022	2,001	2,686	1,626	87,747
ord	6,097	6,095	6,185	4,668	291,917
nternational	3,393	3,420	3,314	2,295	132,046
flack	384	378	351	273	17,550
100	98	52	50	51	3,728
itudebaker	401	347	455	282	14,636
	314	300	305	238	16.852
White	1.500	1.794	1.819	1.182	
Villys	88	100	113	93	61,839 7,436
	26,005	24,108	25.204	17.353	1.070.412
Total-Trucks				2.1000	1,010,916
Total—Trucks	65	79	39	34	4,042

* Prior to Sept. 1, Rambler production was included with Hudson and Rambler.

Export and Military Business Add Force to Willys Progress

Willys Motors has done remarkably well in the two years since it dropped out of the automobile business. A recent report indicates that the company expects to have earnings above \$3 million for 1956.

Export sales continue to grow and are expected to increase 26 per cent this year to a figure above \$60 million. The company expects to ship some 40,000 vehicles abroad this year. In addition, several new vehicles in the Jeep line are expected to hit the market soon.

Willys' growing military business volume has also been a factor in the improved sales picture. Its current military work involves production of a new lightweight tactical vehicle, the "Mechanical Mule," which Willys helped design. The company already has received two contracts for the vehicle from the Army.

AND AVIATION INDUSTRIES



TURBINE BLADES TESTED

Intense heat and vibration which turbine blades endure in jet aircraft engines are duplicated with this General Motors Research Staff laboratory test apparatus. In right foreground, the blades or "buckets" rotate through hat blasts of acetylene flames so engineers see how they stand up under "thermal shock." In left background, the blades are subjected to high frequency vibration while red hot, so engineers can find out whether they develop "fatigue" cracks during operation.

New Chevrolet Parts Depot Being Built Near Atlanta

Another new parts depot will be constructed by Chevrolet under its program to separate parts and accessories operations from main assembly plants. This program will make available more space for possible expansion of production facilities within assembly plants. The latest is a 280,-000 sq ft supply depot northeast of Atlanta, Ga. Ground for the new unit was broken last month. When completed in about a year, the warehouse will stock approximately 20,000 different car and truck parts and accessories which at present are housed at Chevrolet's Atlanta assembly plant.

American Motors Gets \$3 Million Army Order

American Motors has received a \$3 million Army Ordnance contract for production of cupolas for armed vehicles. The order calls for construction of 1400 of the cupolas, to be used on M-59 tank-type, armored troops carriers.

TABLOID

General Electric Co. has announced that its T58 turboshaft engine is now qualified to power experimental aircraft.

. . .

General Motors Corp. is undertaking a multi-million-dollar expansion and improvement program for the Tonawanda, N. Y., Chevrolet engine plant.

Northrop Aircraft, Inc., and Vertol Aircraft Corp. have reported considerable progress toward a proposed merger of the two companies.

Diesel Engine Manufacturers Association has moved its offices from Chicago to 2000 K St., N. W., Washington, D. C. . . . Landis Machine Co. has moved its Detroit office to 12806 Fenkell Avc., Detroit 27, Mich.

International Nickel Co. of Canada, Ltd., plans to develop a \$175 million nickel project in the Mystery-Moak Lakes area in Northern Manitoba.

Pratt & Whitney Aircraft has revealed that tooling for production of its new medium-sized J-52 jet turbine engine is now being planned.

Modern Corp. has changed its name to Modeo Tools, division of Valeron Corp.

Army Corps of Engineers has developed a mine-detecting jeep that automatically comes to a halt when it locates a land mine.

L. O. F. Glass Fibers Co. has purchased a site in Corona, Calif., for plant and warehouse site purposes. . . H. K. Porter Co., Inc., will build a chemical plant in Pascagoula, Miss.

Barber-Colman Co. has opened a new sales office at 7451 E. Slauson, Ave., Los Angeles, Calif. Mallory - Sharon Titanium Corp. will construct a large-scale pilot plant for refining titanium scrap.

Flexonics Corp. has acquired the Flex-O-Tube Div. of Meridan Corp.

Dow Corning Corp. is developing a transparent rubber material to be used as an interlayer in windshield glass of Air Force supersonic planes.

John Deere de Mexico, S. A., is constructing a plant in Monterrey.

Boeing Airplane Co. may build a pilotless aircraft production plant near Parks Air Force Base, Calif.

Goodyear Tire & Rubber Co. recently opened a new equipped laboratory for the development of rubber products which will perform satisfactorily in a radiation environment.

James F. Lincoln Arc Welding Foundation has announced a \$25,000 machine design award program. Closing date is July 15, 1957.

Fairchild Engine & Airplane Corp. has booked business exceeding \$7 million to fabricate major components for a large jet engine now being produced for the military service.

Norton Co. recently dedicated its new electric furnace plant at Huntsville, Ala.

Jones & Laughlin Steel Corp. plans to acquire Rotary Electric Steel Co. of Detroit, leading stainless steel producer. It will mark J & L's entry into the stainless steel field.

Aluminum Co. of America has demonstrated a 14-ton truck built by Gerstenlager Co. that can be expanded to five times its road dimensions.

(Turn to page 94, please)

Thews of the AUTOMOTIVE



DIESEL-POWERED AUTOCAR DUMPER OF MAMMOTH SIZE

The AP-15 is the first in a series of giant off-the-highway vehicles projected by Autocar Div. of White Motor Co. Equipped with a 10-speed transmission and a planetary gear drive rear axle, the 15-ton rear dump truck has a 10 cu yd scoop-end rock body with a double-acting hydraulic hoist providing a 70-deg dumping angle.

Poundage of Zinc Die Castings in 1957 Cars Shows Sharp Rise

The average 1957 model car will carry more than 65 lb of zinc, as compared to 60 lb used on the 1956 models, according to the American Zinc Institute.

The Institute states that zinc die castings are being used in increasing

volume for trim, tail light assemblies, grilles, decorative moldings, window supports, and headlight assemblies. In addition, they are finding growing favor for such functional parts as carburetors, windshield wiper motors, door handles, window cranks, etc.

1956 RETAIL CAR SALES BY PRICE GROUPS*

Number of Cars

September				Nine Months						
	1956 1955		190		1956 1955		195	6	195	5
Price Group Under \$2,000 \$2,001 to \$2,500 \$2,500 to \$3,500	Units† 65,641 232,734 98,700 17,016	% of Total 15.85 56.20 23.84 4.11	Unite† 387,163 207,895 89,538 15,718	% of Total 86.45 31.97 9.16 2.42	Unite† 813,852 2,516,925 1,032,353 184,878	% of Total 17.89 55.34 22.70 4.07	Units† 3,010,686 1,718,176 589,751 152,712	% of Total 55.03 31.40 10.78 2.79		
Total	414,100	100.00	650,314	100.00	4,548,008	100.00	5,471,325	100.00		

Dollar Volume of Sales

		Sej	ptember			Nine Months			
19		195		1956		190		8	
Price Group Under \$2,000 \$2,001 to \$2,500 \$2,501 to \$3,500 Over \$3,500	Dellare \$128,760,476 499,675,364 268,102,007 73,065,559	% of Total 13.28 51.83 27.85 7.54	Dollars \$887,435,467 485,463,864 196,891,548 62,422,771	% of Total 49.38 34.38 11.82 4.42	Dellara \$1,593,847,590 5,409,055,052 2,842,977,594 783,028,923	% of Total 14.98 60.85 26.72 7.45	Dollars \$5,716,210,962 4,010,583,134 1,665,357,469 618,090,648	% of Total 47.58 33.39 13.87 5.15	
Total	\$960,603,406	100.00	\$1,412,213,650	100.00	\$10,638,308,059	100.00	\$12,010,242,213	100.00	

*—Calculated on basis of new car registrations, as reported[by R. L. Polk &[Co., in conjunction]with advertised delivered price at factory of four door sedan or equivalent model. Does not include transportation charges or extra equipment.

†—New registrations of American made cars only. Does not include imported foreign cars.

Chrysler Donates More Funds To Cornell for Crash Studies

Chrysler Corp. has granted an additional \$100,000 to the Cornell Univ. Medical College for further work on its automotive crash injury research program. The latest grant brings to \$300,000 the amount donated by the corporation for analyzing automotive crash injuries and their causes.

Air Force Gives Allison \$20 Million Engine Job

An Air Force contract valued at \$20.2 million has been awarded to the Allison Div. of General Motors Corp. for production of J71-A-Z aircraft engines. Other contracts announced by the Air Materiel Command of Wright-Patterson Air Force Base include a \$6.1 million award to Four Wheel Drive Co. for multi-purpose trucks, and \$5.8 million to Douglas Aircraft Co. for fabricating modification kits.

UAW Excise Tax Repeal Plan Has "Joker" for Car Makers

The UAW has thrown its support behind industry efforts to repeal automotive excise taxes. At the same time, it has made a recommendation which would subject automobile manufacturers to certain commitments should the taxes be repealed or reduced.

The proposal is that car companies give public assurance that they would not increase prices to offset any possible reductions made in excise taxes. UAW President Walter P. Reuther has urged that such a condition be made a part of any recommendations made for excise tax relief.

While such a "pledge" by automobile companies may have its merits, it certainly would place them in a somewhat disadvantageous position. They would have to take extreme and undue precautions from the viewpoint of public opinion in making future price adjustments.

The UAW has asked that excise taxes be reduced to at least the pre-Korean level, if not totally repealed. Chances for repealing the taxes, however, face opposition by Treasury officials, who are urging they be continued beyond the April 1 expiration date.

AND AVIATION INDUSTRIES

DeSoto Sets Price Schedule On Four New Station Wagons

Prices on DeSoto's 1957 station wagons range from \$2843 to \$3715, exclusive of taxes and other charges. Aware of the growing market for utility vehicles, DeSoto has expanded its station wagon line to include four models, compared with only one in 1956.

These include two in the lower priced Firesweep series. They carry list prices of \$2843 for a six-passenger model and \$2974 for a nine-passenger.

Two others in the Fireflite series are a six-passenger unit priced at \$3583 and a nine-passenger model for \$3715. The only station wagon offered last year by DeSoto was in the Firedome series, and that model has been discontinued.

Dana Sales and Earnings Hit Peak for Fiscal '56

Sales and earnings of the Dana Corp. were the highest in its history for the 1956 fiscal year. Total sales hit \$228,531,000, an increase of 22 per cent over the \$186,564,000 for the comparable 1955 period.

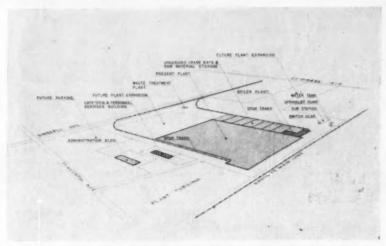
Record earnings of \$17,342,918 were also reported. This compares with \$15,302,956 for 1955.

Rheem Automotive Dedicates Fullerton, Calif., Facility

Flexibility characterizes the new multi-million dollar plant of Rheem Automotive Co. at Fullerton, Calif. The company formally dedicated the new facility on Dec. 12, 1956.

The division manufactures a complete line of bumpers, bumper guards, bumper hangers, coil springs, leaf springs, spring shackles and torsion bars for automobile assembly plants on the Pacific Coast and in the Southwest. Other products include highway guard rails, guard rail brackets and forged oil tools.

Several interesting features have been incorporated in the main plant building (see illustration). Electric power distribution is handled from 12 unit load centers within the manufacturing plant and one outside the plant adjacent to the boiler room. The unit load centers are suspended above the floor on balconies.



Three-dimensional plot plan of Rheem Automotive Co. shows planning for flexibility.

Another interesting flexibility feature is the overhead crane installation. Seven of the nine storage bays are equipped with five-ton tramrail cranes.

Six of the tramrails have interlocks and crossover rails so the cab and hoist units may be transferred from one bay to another. All crane rails extend 40 ft into the manufacturing area for delivery of material to the first operation.

The plating installation for auto-

mobile bumpers and bumper guards is the largest of its kind in the West and is completely automatic. It was designed and built by Udylite Corp.

By means of electrically-controlled, hydraulically-operated devices, intricately designed bumpers are being plated uniformly and at high production rates. This straight line plating machine carries the bumper through 31 operations.

(Turn to page 94, please)

SLIGHT DECLINE PREVAILS OVER PREVIOUS SURGE 1956 New Truck Registrations*

Arranged by Makes in Descending Order According to the 1956 Nine Months' Totals

					MILE IN	DNTHS	HS		
				Ur	iits	Per Cent	of Total		
MAKE	September 1956	August 1956	September 1955	1956	1955	1956	1955		
Chevrolet	24,146	26,451	32,133	229,592	233,290	33.49	33.30		
Ford	21.587	24,690	28,443	204,324	222,673	29.80	31.79		
nternational	9.156	9.727	8,261	83,418	77.992	12.17	11.13		
G.M.C.	6,583	7.021	8.560	64,174	58.609	9.36	8.37		
Dodge	4,394	5.182	5.864	44,098	50.376	6.43	7.19		
White	1.208	1.133	1.469	11.818	10.443	1.72	1.49		
Willys Truck	1,201	1.174	1.328	10.059	11.886	1.47	1.70		
Vlack	1.058	1.222	877	10.023	7.761	1.46	1.11		
Studebaker	635	778	834	7.189	8.550	1.05	1.22		
Willys Jeep	861	766	831	6.403	7.215	.93	1.03		
Diamond T	286	330	330	3.048	2.680	.44	.38		
Divce	262	234	301	2.480	2.505	. 36	.36		
Rea	235	237	344	2,261	2,228	.33	.32		
Kenworth	114	152	103	1.027	807	.15	.12		
Brockway	40	50	86	711	776	.10	.11		
Peterbilt	42	49	29	454	331	.07	.05		
F.W.D.	24	55	35	334	195	.05	.03		
Mine Physicantic	144	97	96	881	721	.13	.10		
Vilsc. Demestic	436	483	200	3.368	1,419	.49	.20		

Total-All Makes	72,420	79,831	89,924	685,662	700,466	100.00	100.00		

Men in the News



Eaton Manufacturing Co.—Sydney E. Cowlin has been named director of market research.



SKF Industries, Inc.
—Stuart H. Smith has been elected vice-president in charge of sales.

Chevrolet Motor Div., General Motors Corp.-E. P. Feely was named assistant general sales manager for the Eastern half of the U. S.; A. W. Famular, assistant general sales manager for the Western half of the U. S.; I. W. Thompson, assistant general sales manager for parts and accessories merchandising and warehousing; L. N. Mays, assistant general sales manager for the central office; H. P. Sattler, assistant general sales manager for commercial and truck operations; Roy M. Cash, Pacific Coast regional manager; N. J. Johnson, assistant manager, Pacific Coast region; Robert D. Lund, national sales promotion manager; and J. E. Conlan, national truck manager.

American Brake Shoe Co.—Kempton Dunn has been elected chief executive, and William B. Given, Jr., continues as chairman of the board.

Ford Div., Ford Motor Co.—Frederick J. Hooven has been appointed executive engineer in charge of advanced Ford car product engineering, and J. L. Hooven has been named executive engineer in charge of advanced Ford truck product engineering.

Lindberg Engineering Co.—John R. Duffy has been appointed chief engineer.

Pratt & Whitney Co., Inc.—Harry Reichert has been named a vicepresident, and Clinton E. Smith has been made assistant to the general sales manager.

Vickers, Inc.—R. J. Sullivan is now director of quality control.





Lapointe Machine Tool Co.—Paul N. Stanton has been promoted to sales manager, while Joseph P. Crosby remains vice-president in charge of sales.

Studebaker-Packard Corp.—James J. McTernan, Jr., has been named controller, and Arthur E. Gotsch has been made treasurer.

Mercury Div., Ford Motor Co.— Richard S. Hanel is now marketing administration manager.

Houdaille Industries, Inc., Automotive Div.—Gordon O. Rice has been appointed sales promotion manager.

Bell Aircraft Corp., Rockets Div.— Floyd H. Walters was named director of manufacturing.

A. O. Smith Corp.—U. T. Kuechle and Roy A. Dingman were named vice-presidents. Robert A. Rietz was named assistant secretary.

Electric-Auto-Lite Co.—Francis M. Wistert and Robert E. Valk were elected vice-presidents.

Oldsmobile Div., General Motors Corp.—Roland E. Gifford has been appointed used car merchandising manager.

Chrysler Corp.—Russell S. Rockafellow has been appointed director of production engineering.

Stackpole Carbon Co.—H. S. Conrad was elected president to succeed Lyle G. Hall, and J. Hall Stackpole was re-elected chairman of the board. A. A. Haberberger was elected vice-vice-president and general works manager; E. J. Hammer, elected vice-president and director of industrial relations; and Lyle G. Hall, Jr., was elected assistant secretary. H. A. Williams was named general manager of the Electronic Components Div., and Harrison C. Stackpole was made general manager of the Carbon Div.

American Motors Corp.—W. H. Thoreson has been named director of automotive export, and M. L. Hudson has become director of automotive export sales.

Ohio Crankshaft Co., Crankshaft and Camshaft Div. — A. H. Schott was made general manager.



Ransohoff, Inc. — Bernard S. Reckseit has been appointed chief engineer.



Studebaker-Packard Corp.—Sydney A. Skillman has been appointed assistant general sales manager for both Studebaker and Packard marketing activities in South Bend, Ind.

(Turn to page 94, please)

Necrology

Joseph S. Levene, 59, assistant superintendent of planning and purchasing for Chrysler Corp. of Canada, died Dec. 5, on a business trip to Toronto.

Frank F. Keefe, 52, Eastern regional sales manager for Willard Storage Battery Co., was killed in an automobile accident recently.

William P. Woodside, 79, renowned metallurgist, died Dec. 5, at Phoenix, Ariz.

Otho R. Overmeyer, 80, automotive pioneer, died recently, at Detroit, Mich.

Victor Mauck, 82, chairman of the boards of John Wood Co. and Nicolet Industries, Inc., died Dec. 2, at Bryn Mawr, Pa.

Parry H. Paul, sales engineer for Autocar Div. of White Motor Co. and former employee of Chilton Co., died recently, at Haverford, Pa.

"Production up more than 30% since using Texaco's tri-purpose oil"

... Pacific Fittings Division, General Metals Corporation, Hollydale, California

This plant, the largest pipe fitting manufacturer on the Pacific Coast, enjoys outstanding results with Texaco Cleartex Oil. Reports Superintendent Frank Morino:

"Since the introduction of Texaco Cleartex Oil DD as the hydraulic, lubricating and cutting oil in our automatic chuckers, we have increased production more than 30%.

"With no separate hydraulic oil to dilute the cutting coolant, we're getting longer tool life. Gear boxes and lubricating oil lines stay much cleaner. The consistent uniformity of Texaco Cleartex Oil DD gives us better finish on machined parts, even under stepped-up production schedules. And the transparency of the oil makes work inspection a lot easier."

There is a complete line of Texaco Cutting, Grinding, Soluble and Hydraulic Oils to help you do all your machining better, faster and at lower cost. A Texaco Lubrication Engineer will gladly help you make the proper selection. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

> Pacific Fittings Division produces a full line of pipe fittings, nipples and couplings. The New Britain Gridley automatics shown here use tri-purpose Texaco Cleartex Oil DD exclusively. For the past 10 years, this plant has relied on Texaco Products and Texaco Lubrication Engineering Service to keep operating efficiency high, mainte costs low.





TUNE IN . . . METROPOLITAN OPERA RADIO BROADCASTS EVERY SATURDAY AFTERNOON

Q

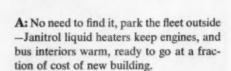
How to heat vehicles?

Q: Chilly day at Thule (-50°F.)...how to start fire-crash truck within seconds, provide 90,000 Btu/hr. in small space?

A: Janitrol liquid heater (tested to -65°F.) keeps engine ready to go, provides cab and cargo heating too!



Q: How to find money to build heated storage buildings for Diesel bus fleet?



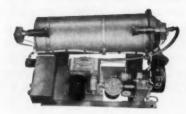


A:

A: Call on Janitrol. If there's a need for heat for the job anywhere, chances are Janitrol can supply it, or build it from service-proved components.

Ever since designing and manufacturing the first successful heaters for aircraft 14 years ago, Janitrol has built thousands of heaters for aircraft and ground vehicles.

Today the name Janitrol stands for leadership in heating equipment and combustion engineering. Your Janitrol representative is always at your service.





AIRCRAFT-AUTOMOTIVE DIVISION, SURFACE COMBUSTION CORPORATION, COLUMBUS 16, OHIO DISTRICT ENGINEERING OFFICES: WASHINGTON, D.C., PHILADELPHIA, COLUMBUS, FT. WORTH, HOLLYWOOD



Part of the big news beneath the hoods of many outstanding 1957 models is Bendix-Skinner's revolutionary new dry filter for engine air. Rated at 99.6% efficiency it screens out dust and abrasive particles right down to micron size . . . and can almost double engine life.

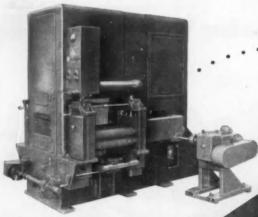
Helping this dry filter do the job is the important new DARAFLOW Compound that holds together the filter paper and protective screen. Applied by the DAREX "Flowed-in" PROCESS, this compound quickly "sets up" into permanently molded resilient rings at the top and bottom of the filter. The assembly is thus sealed against air leakage around the filter paper . . . and the same

gaskets make the unit air-tight in the cleaner frame.

DARAFLOW Compound was researched and developed by Dewey and Almy for the Bendix-Skinner Division of Bendix Aviation Corporation. They chose DAREX "Flowed-in" GASKETS for these reasons: production is fast, controls are less critical, performance is consistent, application equipment is readily available. And Dewey and Almy technical service is unbeatable.

The Darex "Flowed-in" Gasketing Process has many other automotive applications. Ask for additional information today.





ABRASIVE BELT GRINDING & POLISHING MACHINE

(Pinch Roll Type)

For pre-finishing, conditioning and polishing sheets, plates, strips or blanked-out shapes in flat form. Used as single units or in multiple units for progressive line polishing.

for FINISHES
that pass inspection
FIRST TIME get a HILL
ing & Polishing Machine



The basic HILL two-rall vertical head with endless abrasive belt. Used in both the Pinch-Roll and the Hydraulic Table types.

HILL 2-ROLL Vertical Abrasive Belt Grinding and Polishing Machines are made in two general types for producing superior finishes on flat surfaces as required by manufacturers of a wide variety of products such as decorative plastics, auto bumpers, engravers plates, home appliances, etc.

Both types are built in polishing widths up to 60" and larger sizes can be furnished if desired. Your problem will be given our prompt and careful attention.

ABRASIVE BELT POLISHING MACHINE

(Hydraulic Table Type)

For flat polishing of sheets and plates of ferrous and non-ferrous metals. Made in a variety of table widths and lengths with full hydraulic reciprocating table.



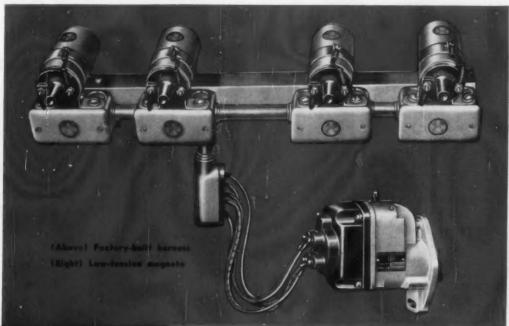
THE HILL ACME COMPANY

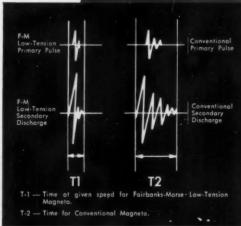
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"HILL" ERINDING & POLISHING MACHINES • NYDRAULIC SUFFACE GRINDERS • ALSO MANUFACTURERS OF "ACME" FORGING • THREADING
TAPPING MACHINES • "CANTON" ALLIGATOR SHEARS • BILLE, SHEARS • PORTABLE FLOOR CRANES • "CLEVELAND" KNIVES • SHEAR BLADES

New LOW-TENSION ignition systems

improved firing gives longer service on 1, 2, 4, 6, 8 - cylinder spark-ignited engines





New model engines with their higher compression ratios, as well as thousands of engines already in the field, all show vastly improved performance with the Fairbanks-Morse low-tension ignition system. The short duration, high peak voltage spark liberates more than enough energy (heat) to ignite a full charge under all engine operating conditions.

Bearings and other magneto parts last longer because there is no problem with ozone or high corona discharges within the magneto case. In addition, a major improvement in spark plug life results from reduced electrode erosion due to the shortened voltage-time characteristic.

Fairbanks-Morse low-tension magnetos are no larger than standard units, thus simplifying installation. Complete factory-built harnesses that include transformers, junction boxes, mounting hardware, lead wires, etc. are available for nearly all popular engines up to 4000 cu in. in displacement.

MORE THAN 4,000,000 MAGNETOS IN USE





MAGNETOS - REWIND STARTERS - WATER SYSTEMS - GENERATING SETS PUMPS - MOTORS - SCALES - DIESEL LOCOMOTIVES AND ENGINES

Fairbanks, Morse & Co., Magneto Division Beloit, Wisconsin

Please send Bulletin FM238A describing the Fairbanks-Morse low-tension ignition system.

Company

Company

Address State

flexible

for drilling or reaming either 4 or 6 cylinder heads . . .

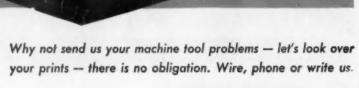
A leading tractor manufacturer asked us to design and build a single machine that would handle the drilling and reaming of both 4 and 6 cylinder heads for tractor engines.

HERE IS THE MACHINE . . .

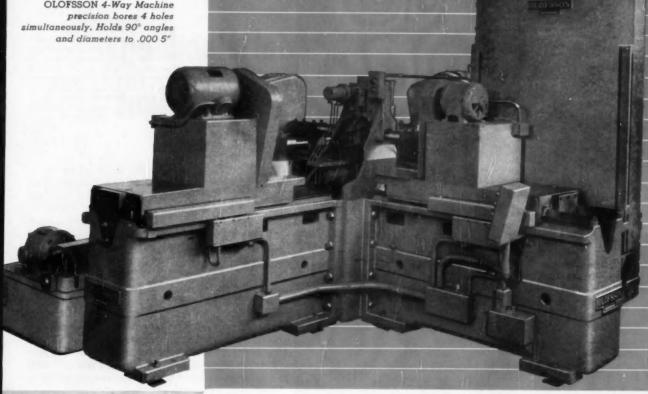
BAUSH VERTICAL W-8 HYDRAULIC MULTIPLE SPINDLE DRILL with a 7-position tunnel-type fixture, for progressive working positions to drill and ream all sides of head. Fixture is equipped with air clamping and electrical interlocking.

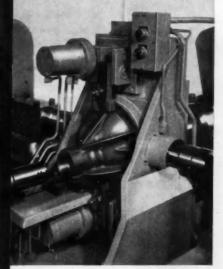
Machine has a 28" x 54" rectangular fixed center head with a 2-speed geared yoke and has a master-bored cluster plate for 80 holes, furnished with 80 slip-sleeve adjustable joint driven spindles. By removing or inserting the 1/4" to 5%" tools in the proper spindles a quick changeover from 4 to 6 cylinder heads is made. Spindles are driven by a 30 H.P., 1800 RPM motor and hydraulic pump is driven by a 5 H.P., 1800 RPM motor.





OLOFSSON 4-Way Machine precision bores 4 holes simultaneously. Holds 90° angles and diameters to .000 5"





Close-up view of differential carrier, hydraulically cam-clamped in position for boring.

for MORE production and precision, combine 1, 2, 3, or 4 OLOFSSON way units in any COMBINATION

OLOFSSON Precision Way Machines perform fast, accurate boring, facing, turning, grooving, and chamfering. Units are electrically interlocked, and the spindles move to the work.

For long, dependable, and accurate operation Olofsson Way Units feature:

- Single push-button control panel.
- Hardened and ground V-style ways.
- Hydraulic control Valves, manifold mounted and located with reservoir.
- Parker Majestic precision boring spindle.
- Rigid ribbed, nickle iron base.
- Adherence to latest J.I.C. recommendations.
- Hydraulic pump units located outside base.
- Automatic central lubrication system.
- Dwell time not affected by positive stop screw adjustment.

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MANUFACTURERS OF PRECISION BORING MACHINES AND SPECIAL MACHINERY

Advanced Material Handling at Large Parts Maker's Plant

By Joseph Geschelin

NoteD for its development of advanced manufacturing techniques, AC Spark Plug Division of General Motors Corp. is currently engaged in a plant-wide process improvement program.

Material handling has become an increasingly major factor of operating economy with the growth in size of components such as air cleaners. The program is aimed at the complete integration of individual lines, a greater extension of conveyorization to reduce manual handling, and the development of process lines that can operate without stored banks. Other avenues of approach are also being explored. One example is the setting up of lines of equipment of competitive types

to determine whether some new or different method may be superior to that now in use. Fruition of some of these objectives was shown to members of the press during a recent open-house gathering held in the Flint, Mich., plant.

One of the best examples of past progressive planning at AC was the development of its self-contained instrument plant, in which the scheduling of component parts to assembly lines was accomplished by automatic means through the installation of an extensive Jervis B. Webb power-and-free conveyor system. This operation was described in AI, April 1, 1954.

In preparation for 1957 production, AC added a

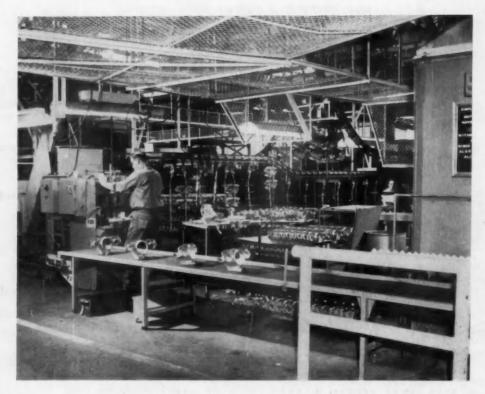


FIG. 1

Belf conveyors are employed extensively at AC. Here is one that transports Chevrolet instrument panel bodies to the shipping area.

FIG. 2

Unique development of automatic loading and unloading suited to a specific part is this setup for handling instrument nacelles. They are discast in the machine at the extreme right and transported to the trim press in the foreground by blowing through the tube connecting the two. After trimming, the parts are blown through the tube extending upward at the extreme left, directly to the buffer.

28,000 sq ft bay to the original instrument plant, featuring advanced assembly methods: and coordinating the new assembly lines with the existing power-and-free conveyor system. Profiting by experience, the new bay was eight feet higher to provide better ventilation and lighting. As a result of this, however, the increased distance to the overhead conveyor lines made it necessary to operate the hangers by electrical means and special electrical controls, in contrast to the air cylinders employed for raising and lowering the hangers in the other departments.

It is noteworthy to mention at this point that the simplification of 1957 instrument panel assemblies—reduction in the number

FIG. 3

Here is one of the three new 900-ton Verson transfer presses at AC. This one employs either six or five stations depending upon the job. Out of this view, at the extreme left, the parts are deposited automatically onto a belt conveyor that transports them to the washer in another bay.

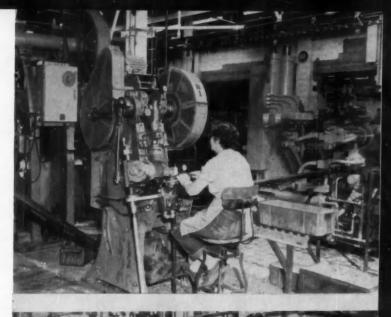
of instruments in some cases, and the use of a printed circuit for Oldsmobile, for example—aided in reducing the number and the size of components in transit, thereby reducing the number of hangers required in the system. Because of the flexibility of the power-and-free system as installed, it is now possible to tie additional circuits into the system, thereby leaving an avenue for extending the system to serve other operations.

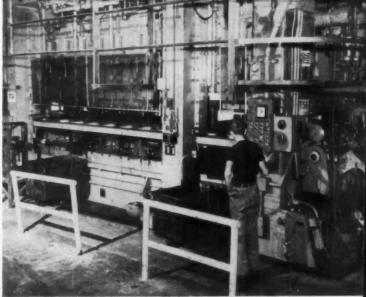
It is our intention to indicate the various improvements in technique by means of suitable illustrations. One example is found in the great simplification of assembly

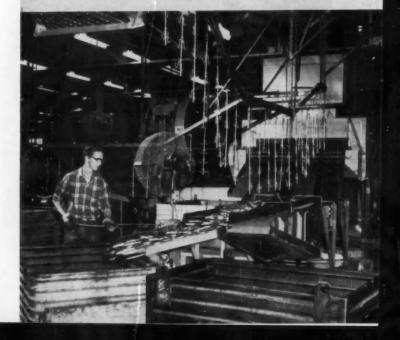
FIG. 4

Exit end of the big washer which carries a variety of parts on a four-channel conveyor system. Each channel is unloaded onto its own distribution chute and the parts are then permitted to drop into a suitable bin or feeder monorail conveyor.





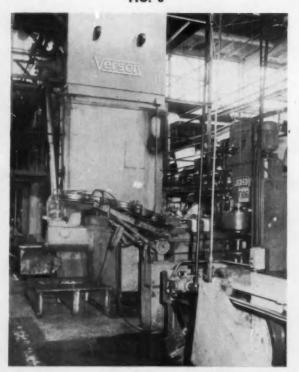






Redliner speedometer tubes are painted and inspected along this line, then placed on trays on the monorail conveyor for transport to the assembly department.

FIG. 6



One of the big Verson transfer presses employed on air cleaner parts. Here may be seen an ingenious wire cage chute arrangement for turning parts over into proper position for succeeding operations. It represents one of the simple devices for automatic loading and unloading, as well as positioning.

operations on the Oldsmobile instrument panel line, stemming from what is considered to be the first use of a printed circuit for this purpose.

Most of the examples to be described here are concerned with improved material handling. Typical of this is the use of a belt conveyor for transporting Chevrolet instrument panel bodies to the shipping area, where they are prepared for delivery to assembly lines. The conveyor, shown in Fig. 1 transports the parts onto another belt conveyor at right angles to carry the work to the packers.

Another noteworthy example of specialized material handling is found on the integrated line for making instrument nacelles. As seen in Fig. 2, the nacelles are made in the die casting machine at the right, ejected automatically and blown through a tube directly to the operator at the trim press in the foreground. After trimming they are blown through the tube at the left directly to the buffer.

AC makes a large variety of parts that require electroplating, handling these in an impressive Hanson-Van Winkle-Munning automatic plating machine. The unit is not new but it has been expanded in size and features new provisions for safety and ventilation. An interesting feature of the equipment is its ability to handle parts up to six feet in length.

In the making of deep drawn shells of various forms and sizes associated with the production of air cleaners, oil filters and other products, AC was one of the pioneers in the adoption of Verson transfer presses. Today the company has a battery of 18 transfer presses, ranging in capacity from 100 to 900 tons, three 900ton Verson presses being new acquisitions. AC has in addition, a large number of progressive die presses for small parts and items more suited to this technique. However, the integration technique has changed the picture of transfer press operation materially. The 900-ton Verson press seen in Fig. 3 discharges the finished stampings onto an inclined belt for transportation directly to the washer without manual handling.

One of the large washers, shown in Fig. 4, presents another step in mechanization. Parts come in from the opposite end on four different conveyor lines and go through the washer in four lanes as shown. At the exit end, illustrated, the parts are picked off

by operators, and consigned to storage tubs or hung on monorail conveyors.

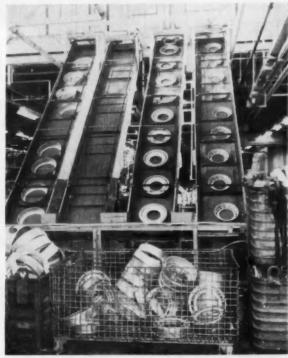
Red liner speedometer tubes, now supplied to Buick and Pontiac, are made on an integrated line, Fig. 5. Tubes are received as Alcoa aluminum impact extrusions, and proceed through seven operational steps—pierce, notch, and load on conveyor; wash; spray prime coat; dry; spray fire-orange paint; dry; unload and silk screen black paint; load on monorail. The part dries while on the conveyor.

The constant search for simplified and automatic methods of handling has resulted in another set-up illustrated here. Large diameter air cleaner parts produced in one of the 900-ton transfer presses require change in direction and turnover upon leaving the press, for proper pre-positioning in the spinning machine; and later pre-positioning for the washer to drain water from the parts. As will be seen in Fig. 6, positioning is done by means of an ingenious wire-cage chute.

Among the latest methods being investigated at AC is an integrated material handling arrangement designed to provide a smooth and constant flow of components to the air cleaner assembly line. As the components come out of the washer they are transferred to one of a number of sharply-inclined Swedish-steel belt conveyors for transport to the gallery seen overhead in Fig. 7. Each of the horizontal conveyor lines is provided with electrically-controlled dams to prevent an accumulation of parts at any point. Parts are switched automatically to the chutes leading to various operations, as shown in Fig. 8.

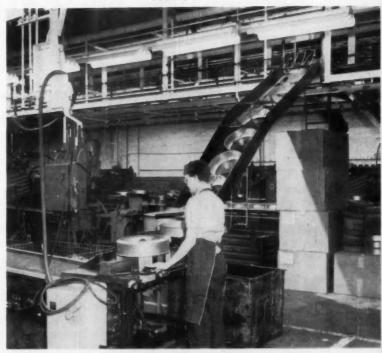
As parts are removed by the operator, leaving room on the chute, the dam is actuated to release sufficient parts to fill. This system is one of many devices being employed in an effort to assure uniform and constant feeding of operations with a consequent elimination of parts banks. At the same time it makes things easier for the operators by bringing the work directly to the operation without having to reach into a bin or overhead to a monorail conveyor.

As we indicated earlier, conveyors are not new at AC. However, mechanization of every kind is being extended throughout the plant on a scale much greater than heretofore. At the present writing AC boasts 13 miles of monorail conveyors, 5000 ft of belt conveyors, and 7000 ft of assembly conveyors—almost 16 miles in all.



This marks the first use at AC of a Swedish-steel belt conveyor system for feeding assembly stations. The group of four belts seen here transports large air cleaner parts to the four-channel overhead gallery, thence to individual sub-assembly and assembly stations.

FIG. 8



Here is one of the sub-assembly stations on the air cleaner line. It is fed from the overhead gallery, stampings being supplied continuously via the chute.



In 1909, 40 manufacturers of construction equipment staged ARBA's first Road Show. At that time, steam shovels and steam rollers were the only power pieces. The roller here is compacting a macadam road. The bottom-dump wagon is hauling in the stone. Both devices were standard equipment on display at the first Road Show in Columbus, Ohio.

Huge Display Will Be of Special Importance with the Launching of America's New Highway-Building Program

HE new automotive equipment that will build America's highways will be put on display at the 1957 Road Show, to be held January 28-February 2 at the International Amphitheatre, Chicago, the first show in nearly nine years. It will be held in connection with the 55th Annual Convention of the American Road Builders' Association, with sessions in the Congress Hotel.

From the number of advance reservations, it is estimated that about 45,000 contractors, municipal, county, and state highway supervisors, and others interested in roadbuilding will attend the convention and show. The Road Show is of special importance because it is held at rather long intervals, and because those in the industry have little opportunity other-

wise to see displays of the newest machines of the leading manufacturers at one time and place.

There will be about 260 exhibitors, members of the Construction Industry Manufacturers Association, and of the Materials and Supply section of American Road Builders' Association. This year it was decided to go back to the usual practice and hold the show during the winter months, and indoors, after trying an outdoor summer exhibition at the last prior event. This was held July 16-24, 1948, at Soldier Field, Chicago. While the outdoor location permitted more liberal use of space—it covered an area equal to that of 30 football fields—there was some complaint from contractors that summer is their busy season, and that they have difficulty in getting away at that time.

Equipment at 1957 Road Show



At the time of the first Road Show in 1909, long trains of teams and dump wagons could be kept busy by one steam shovel.

This was a grandfather of today's modern efficient line.

While manufacturers promise to have on exhibition their newest equipment, they have refused to state in detail what they expect to show. There will be new models of tractors with their related equipment; motor graders; off-highway vehicles; cranes and shovels of many kinds, with many kinds of attachments and other auxiliary equipment; concrete and bituminous processing equipment, and a wide variety of miscellaneous equipment and supplies. Much of the machinery will be on display for the first time, exhibitors say. The show will occupy both floors of the North and the South Halls at the Arena, the Exposition Hall, and Donovan Hall. This represents a gross area of about 525,000 sq ft, with about 370,000 sq ft for displays. It has been estimated that nearly 5000 pieces of equipment will be shown.

The 1957 Road Show will have as its theme, "Productivity on Parade," and will stress the role that machinery plays in modern road building. Present-day highway costs are moderate because of the high

productivity of the machinery used to build them. A group of cost experts in the Federal Bureau of Public Roads has estimated that today's roads, if built by the machinery and the methods used 30 years ago,



The 1948 ARBA Road Show was the largest outdoor exposition of construction machinery ever assembled.



1925

By the time of the 1925 Road Show, America was in the middle of a road building boom. Few Americans outside the industry realize that highway construction costs are as low today as they were in 1925—30 years ago in spite of increased labor and material costs. The reason—larger, faster machines with greater work load capacity.

1930

The depression hit the Road Show in 1930, and a few years after this photo was taken, the Show all but folded.



would cost nearly twice as much as at present. Another expert in the equipment field, using tractor horsepower and operator's wages as comparison factors, stated that in 1935 tractor horsepower was about 95, and the operator's wages about \$1.09 per hour; by 1941, horsepower had gone to 113, and wages to \$1.50; in 1948, the year of the last prior Road Show, horsepower was 130, and wages \$2.25; in 1955, 230 horsepower and \$3.25. The 1957 Road Show will display the machinery responsible for this increase in productivity, with a glimpse into the future toward the continuing rise.

In addition to making possible good roads at moderate cost, the higher power, higher speed, and allaround higher productivity of today's equipment is making possible safer roads. Highway engineers, knowing the higher capacity of equipment to be used, can now plan a road to run through an obstacle, rather than to go around it in dangerous curves, or

over it in view-obscuring rises. Roads can be built wider, with adequate shoulders and approach lanes.

This year's Road Show will be held just when contractors, with the tremendous road program in its early stages, will be checking over their equipment, and looking for the newest and best in the market.

At the sessions of the convention, talks will be given by several top political leaders, including Senator Albert Gore, of the Committee on Public Works, and Hon. George H. Fallon, of the House Committee on Public Works, a co-author of the Federal Highway act. The sessions will include a number of technical papers dealing with the design, construction, and use of highways, airports, and similar works built with earthmoving and paving equipment. There will also be several symposiums at which panels of experts will discuss problems submitted to them. The convention banquet will be held Thursday night in the Conrad Hilton Hotel.

1931

Here is what equipment looked like in 1931, at the Road Show in St. Louis. Many of the firms exhibiting here survived the depression.





1940

The 1940 Road Show was held in the Old International Amphitheatre in Chicage, the last before World War II. The 1957 Show, to be staged in the new Amphitheatre, will be the largest indoor Road Show of all.

The Road Show dates back to 1909, when an exhibit of roadbuilding equipment, mostly horsedrawn, was held on the Ohio State Fairgrounds at Columbus. It occupied 40,000 sq ft of space. At that time few states had effective road programs, and 25 states did not even have highway departments. There were already more than 300,000 automobile owners in the country, however, and they were demanding roads made of better materials than dust and mud. Farmers were beginning to grumble about the knee-deep mud and ruts on rural roads. The American Road Builders' Association had then been in existence for only six years. Manufacturers were beginning to sense the need for equipment for building roads, and engineers were beginning the drive for mechanization.

By the time of the eighth road show, held in 1917 at Boston, the 40 exhibitors at the first show had increased to 106. During the 1920's the automobile had become the dominant means of personal transportation, and the "good roads" movements had hit the construction industry. During the 1930's the road-building industry suffered along with the rest of American business, but by 1940 an important show, with a large attendance, was held. The war slowed road construction to a maintenance pace, and contractors went into defense work. It was eight years before the Road Show could be renewed. Then, with a tremendous construction job to be done, equipment manufacturers put on display their new designs, exhibiting about \$15,000,000 worth of machinery and supplies in 800 different categories.

Since that time there have been significant developments in construction equipment, with emphasis upon time- and cost-saving features. The machines have increased in capacity, versatility, ease of handling, and speed, with lower maintenance cost and lower fuel consumption. These are the pages of progress that will be unfolded at the 1957 Road Show.

Schematic illustration showing hydraulic system of the transmission

VACUUM MODULATOR VALVE VACUUM MODULATOR ACCUMULATOR ENGINE VACUUM OIL COOLER OIL COOLER OIL COOLER OIL COOLER OIL COOLER DETENT STATOR CONTROL VALVE MANUAL SELECTOR VALVE MEUTRAL ACCUMULATOR NEUTRAL ACCUMULATOR MEUTRAL ACCUMULATOR

PRESSURE REGULATOR

Design and Operation

of the

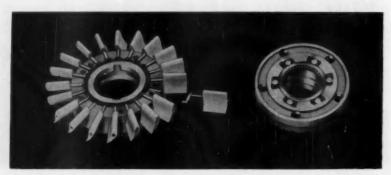
Turboglide Automatic Transmission

Since the introduction of the 1957 Chevrolet line additional details have become available on the design and operation of the new Turboglide automatic transmission. The following material will supplement the initial news summary of design features.

Turboglide embodies a unique hydro-dynamic driving principle that eliminates any clutch or band type engagement from standstill to top speed. Three turbines of a five-element torque converter are connected individually to the output shaft through the elements of two simple planetary gearsets. Thus, total torque multiplication is the product of both the torque converter and gear ratios.

It may be noted that maximum torque multiplication is of the order of 4.3 to 1 with the variable pitch stator at performance angle. With the stator in low or economy angle, torque multiplication is 3.8 to 1.

The design readily lends itself to the extensive use of aluminum, resulting in spectacular weight savings. The entire transmission housing, for example, is perhaps



Variable pitch stator and hub. An overrunning clutch in the front half of the hub permits the stator assembly to freewheel when the coupling phase is reached

the largest single die-cast part in the world to date, and weighs only slightly more than 15 pounds. The Turboglide transmission option adds only four pounds to the curb weight of a Chevrolet, as compared to 92 lb added with the Powerglide option.

Turboglide design eliminates the necessity for a low range, because the basic arrangement is inherently speed and load sensitive and capable of unusually broad ratio coverage.

Downhill braking is effectively

provided by an arrangement which utilizes the converter itself as an energy dissipating device. Kinetic energy transferred to the converter oil supplements engine breaking to provide up to 15 per cent greater braking effort, while engine speed is increased less than with Powerglide.

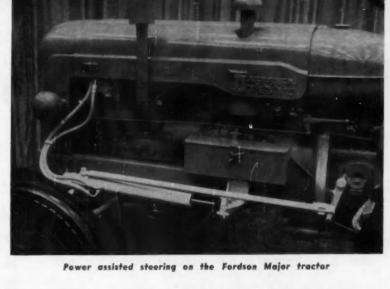
Decreased maintenance is an advantage of the all-clutch design, since the hydraulically applied clutches do not require periodic adjustment to compensate for

(Turn to page 106, please)

Power Steering

on the

FORDSON MAJOR TRACTOR



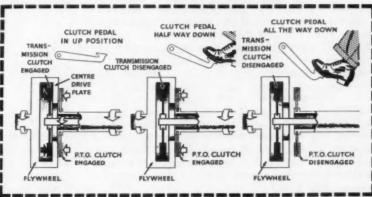
THE power-assisted steering now offered on the British Fordson Major tractor uses a simple in-line unit with a double-acting ram fitted between the front steering arm and a fixed support on the chassis frame side rail. The integral control valve is actuated by the steering drop arm through a drag link and ball stud.

With no turning movement of the steering wheel the spring-loaded spool is centrally located to permit the oil to circulate from the pump directly back to the reservoir. As the spool is moved with a right-hand turn the oil is channeled through the twin-tube cylinder to the under face of the piston, and displaced oil is returned to the reservoir through an internal passage. A left-hand turn reverses this flow pattern.

The combined pump and reservoir are mounted on the engine block and driven by V belt from the crankshaft pulley. Delivery is 2 gpm at 400 psi. This equipment can be installed on existing tractors.

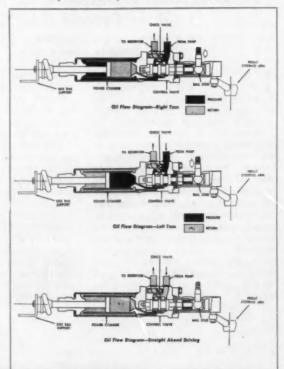
Another improvement on the Fordson is a double clutch with two-position foot pedal which enables the driver to disengage the forward drive during gear shifts without stopping the pto. Thus powered implements can be maintained at a constant speed regardless of tractor speed. The hydraulic lift pump is also driven from the pto shaft to give live operation.

The clutch consists of a double-faced flywheel with its machined surfaces sandwiched between the two 12-in. friction disks and their respective pressure plates. The disks are splined on separate shafts to the gear box and pto. They are independently withdrawn by progressive pedal pressure.



Diagrammatic illustration showing operation of live power take-off

Operation of power assisted steering



AUTOMOTIVE INDUSTRIES, January 1, 1957

Annual Meeting of the ASME

Superscharging Diesel engines, torque converter flexibility, and jet engine alcohol-water injection were among the most important subjects to automotive and aircraft engineers attending the 77th Annual Meeting of the American Society of Mechanical Engineers held in New York recently.

During the course of the week-long meeting. William F. Ryan, vice president, director and senior consulting engineer of Stone & Webster Engineering Corp., was installed as the Society's 1957 President.

In the discussion of Diesel engines, Ernest Chatterton, chief engineer, Piston Engine Div., D. Napier & Son Ltd., stated that the greatest possibility for reducing the size and weight of Diesel engines is the highly-supercharged, two-stroke, compound engine. He fostered the opposed piston layout. One solution to the problem, Mr. Chatterton stated, is the Napier Deltic engine which has opposed piston cylinders arranged in a triangle with crankshafts at each corner (AI June 15, 1953). This particular engine weighs about 2½ lb per bhp; its output is 550 bhp. It was reported that cost of maintenance for this engine has been reduced by using the repair-by-replacement system.

A. K. Antonsen, chief research engineer, Fairbanks, Morse & Co., reported that a program has been under way for some time to turbo charge the More than 300 Papers Presented to 8000 Engineers in Attendance at the Society's 77th Annual Event

By Thomas Mac New

firm's $8\frac{1}{8}$ by 10 in. production engines. These engines are of the two-stroke, opposed-piston, in-line type. Extracts from Mr. Antonsen's paper as well as papers by H. L. Wilke, chief engineer, The National Supply Co., on torque converters, and M. K. Wolfson, manager, J47-J73 Project, GE, on alcohol water injection follow:

The Development of a Supercharged Medium Speed Two-Stroke Opposed Piston Engine

A. K. ANTONSEN, CHIEF RESEARCH ENGINEER Fairbanks, Morse & Co.

In order to increase engine rating and provide better fuel economy, a program has been underway to supercharge the 8½ by 10 in. opposed piston Fairbanks-Morse engines.

It was kept in mind that two-stroke supercharging would require a much closer matching of engine and turbo-charger throughout the load range than what is required for four-stroke engines. Unlike four-stroke supercharging, the two-stroke engine has no natural breathing mechanism which can perform an air-intake stroke when the turbocharger capacity falls off.

It was realized that the best possible fuel economy could be obtained by eliminating or at least limiting the parasitic power requirements of the engine-drive blower. An improved turbocharger efficiency also could be expected to aid in this purpose. It was realized that the manifold design could be instrumental in obtaining optimum performance.

The experimental development has to date covered four individually different systems of supercharging.

Figure 1 illustrates a full-size, engine-driven blower in series with the turbocharger with a non-cooled, pulse-type exhaust manifold. This exhaust manifold is divided in such a manner that overlapping exhaust pulses have been eliminated. The engine-driven blower in this case has been selected for size so that it does not perform any (or very little) work in the range of % to full load.

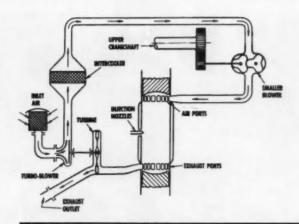
Figure 2 is a refinement of auxiliary-blower arrangement. Auxiliary-air supply is delivered to the turbo-blower intake. Two advantages are inherent in this arrangement. The auxiliary-blower air aids in starting the turboblower and the air mass passes through the intercooler.

The present development has to date covered two systems of pulse-type exhaust manifolds of two different sizes. The larger diameter of the two systems proved advantageous.

Figure 3 illustrates one type of exhaust manifold. In this design the exhaust pulse from the engine is converted to static pressure in the large volume near and within the turbine case.

Figure 4 illustrates another type of exhaust manifold in which the exhaust pulse is carried through a minimum of volume directly to the turbine.

By means of a great number of tests it was established positively that the pulse system, Fig. 4, results in the



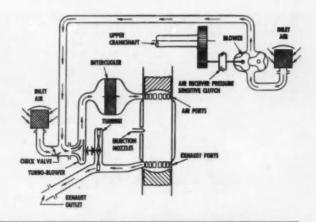


FIG. 1

Diagram of Improved series blower arrangement with calibrated positive blower and non-cooled exhaust manifold

FIG. 2

Diagram of auxiliary positive blower arrangement. Discharge into turbo-blower inlet

most efficient engine and turbocharger combination.

All recent experimental tests have been carried out simultaneously on two six-cylinder engines.

The most rapid progress was made when a turbocharger manufacturer made available an experimental group of parts covering a wide latitude of performances. By means of these parts it was possible to assemble three entire turbocharger variations each of which could again be varied by means of a large number of different nozzle rings.

The combined supercharger efficiency after its matching with the engine appears to be 55—60 per cent, which is an appreciable improvement over the early supercharging experiments.

Initially, the supercharged engine was not self-sustained at fractional loads, but within a period of the last two to 2½ years the experimental engines have been self-sustained over the entire load range including starting.

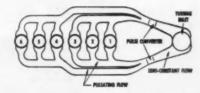




FIG. 3

Pulse converting type exhaust manifold. Firing order 1-6-2-4-3-5 Pulse system exhaust manifold. Firing order 1-6-2-4-3-5

FIG. 4

The self-sustained feature is the result of manifold design together with matching of engine and supercharger.

The application of an auxiliary positive-displacement blower has been dictated by a specified requirement for sudden load changes of large magnitude between idle and 50 per cent load.

The two systems from which to select the performance-wise, most desirable arrangement are those illustrated on Fig. 1 and 2.

Production-wise the general ar-

rangement of turbochargers has worked out with utmost simplicity. All cylinder sizes, 6—8—10 and 12 in. will apply basically the same turbocharger. The 6 and 8-in. cylinder sizes will use a single unit whereas the 10 and 12-in. cylinder sizes will apply two units.

The best fuel economy of the supercharged two-stroke engine is seemingly inherently better than fourstroke supercharged fuel economy. Experimental tests have proved a 0.333 lb/hphr possible for this medium-speed engine.

Torque Converters—A Flexible Drive

H. L. WILKE, CHIEF ENGINEER
The National Supply Co.

PLEXIBILITY of torque converters usually pertains to the ability to proportion torque and speed to the best advantage. But, the torque converter is flexible in still another sense. By the addition of various modifications it can open new fields of applications. Several of these modifications are already available. Converters are

available with dumping valves and controls which make it possible to use the converter as a disconnect clutch by quickly emptying and refilling the working circuit.

Torque converters with free-wheeling stators are available in the converter coupling which serves as a converter during periods of load variation and then as a hydraulic coupling during periods of high-speed low-torque requirements. A good example for the use of this type converter is on an earth-moving scraper where during loading periods high torques are required, but during the hauling phase, high speeds and low torques are needed. The free-wheeling stator changing the converter into a hydraulic coupling performs the high-speed operation at a considerably

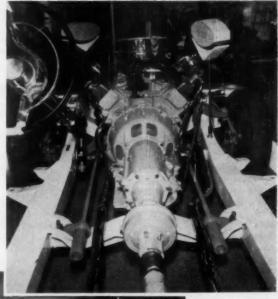
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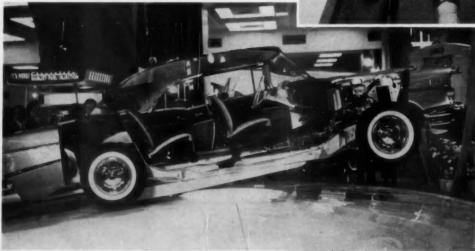
Animated display of GMC Truck and Coach Division's air suspension system. It consists of two wheels, one connected to an air suspension bellows and the other to a steel leaf spring, which rotate independently over rough disks. Small vots of water are mounted above each wheel. Vibrations unabsorbed by each of the spring devices reach these vats and agitate the water. While the water in the vat over the leaf spring churns vigorously, that over the air suspension bellows shows little more than mild ripples.

NATIONAL AUTOMOBILE SHOW

PICTURED on these three pages are a few of the many exhibits at the National Automobile Show held in New York City last month. Attendance at this \$12 million display was far above that of any previous automobile show in the United States. A large percentage of the vehicles and their components were shown as cut-aways; many of the engines, transmissions, etc. were operating.







1957 Chevrolet with engine, transmission, and body cut away.



The Chevrolet truck display included a cutaway of the Super Loadmaster V-8, Powermatic automatic drive, and heavy-duty axle



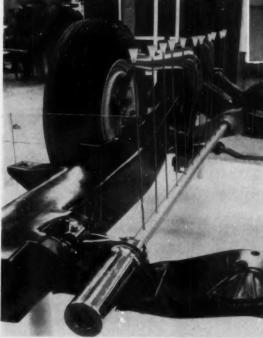
Ford Fairlene 500 with cutaway body showing construction of roof, cowl, seats, etc.

Cutaway display of Oldsmobile's JATO Rocket engine shows oval-shaped air cleaner, and below it, the three dual carburetors which help JATO Rocket develop 300 hp.

View lieft) of the transmission and engine of a Plymouth shows arrangement of the anchored ends of front suspension torsion bar.

Action of a Plymouth front suspension torsion bar was demonstrated (below) by this special arrangement with vertical rods inserted into the bar.







Cutaway of a 1957 Oldsmobile engine, arranged to open at center like a book to reveal Interior construction.

National Automobile Show (cont.)

A "live" cutaway International V-8 truck engine.
When the engine was set in motion, a recording described the components brought into view over six telephone receivers connected to the display.





Select-O-Matic transmission for heavy-duty International trucks. The cutaway unit permitted inspection of working parts and showed how shifting is accomplished without clutch pedal. The new transmission is coupled with a torque converter.



Cutaway model of heavy-duty international truck rear axle

BRAINSTORMING

W. E. Milner

AC SPARK PLUG DIVISION

General Motors Corp.



How It Works

DOZEN men are sitting around a table. They seem tense, animated, eager; they gesture and speak rapidly. Another man sits at the head of the table nodding his head at first one and then another of the men; occasionally he speaks. Still another man is standing at a blackboard, writing without pause; the board is filling up rapidly. At the top, boxed off by lines is the question, "How can we keep scrap parts out of waste paper containers?"

One man says, "Let's educate our people on the problem." Another says, "Let's put a screen over the containers which paper, but not metal will go through." "How about magnetized containers which will hold the metal when the containers are dumped in the incinerator." "Why not suction chutes to carry the papers away," and so on. . . . Finally, the man at the head of the table says, "Gentlemen, we have 32 ideas with a couple minutes still left; let's get five more." The group resumes its activity and shortly a final halt is called. The man at the blackboard counts and announces a final total of 41 ideas. The group then leaves the room and a secretary comes in and starts writing the ideas down on paper. The total elapsed time from when the men first sat down until they left the room was 35 minutes.

These men were not playing a new game; they were tackling a serious plant problem involving loss of parts in waste containers—parts which could be reworked. But they were not following the usual conference procedure; which consists mostly of criticism of new suggestions. Instead, they were using a relatively new approach to problem solving which is called brainstorming.

What Is Brainstorming?

Brainstorming, first of all, is a group problemsolving technique. Of great importance, this technique combines several features which very subtly tend to encourage maximum group participation and contribution of ideas. Its most important aspect is that judgment and imagination are completely divorced from each other. During the session itself, the entire emphasis is on producing ideas by the use of imagination—a cardinal rule is to prevent judgment or ridicule in any form. The assumption is that judgment plays very little, if any, part in the generation of ideas and is far more likely to impede rather than stimulate the imagination. The place for judgment is before and after the imagination has accomplished its work.

Brainstorming also stresses the value of group actively in stimulating ideas. It provides ample opportunity for idea association by exposing members to the ideas of others and by allowing them to see the results on a board or chart.

Deadlines, if not too severe or unrealistic, often spur us to greater activity. All of us at one time or another have surprised ourselves by what we were able to accomplish under pressure. In brainstorming, the leader will frequently establish a goal which he feels can be reached fairly easily by the group; then, as the group nears this goal, he will revise it upwards. Thus, he may say, "Let's see if we can get 30 ideas in the next 15 minutes." When the group reaches 35, he may say, "Let's see if we can get 10 more in the next 6 minutes." Thus, the group is constantly striving to reach a goal, but the goal is never set too high so as not to discourage the creative impulse.

Although the group setting encourages competition among members, thus stimulating the flow of ideas, it must be emphasized that production of ideas is, in the final analysis, a group responsibility. The notion that they are completely on their own can have a depressing effect on the creative efforts of some people. Such individuals will open up considerably once they get the idea that they are part of a group.

Rules for Successful Brainstorming

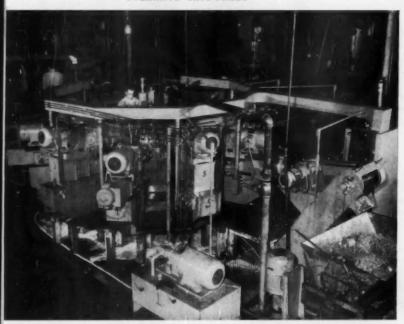
To obtain the best results from brainstorming, it is necessary to follow a definite set of rules. The size of the group must be limited. Too many people will tend to stifle the contributions of individuals; too few may weaken the feeling of being part of a group. A safe maximum, experience has shown, is 10 or 12 persons; the minimum, 5 or 6. Each group should be made up of people in the same income bracket or with comparable responsibilities, so as to eliminate overor under-aggressive attitudes.

If the problem to be discussed is a technical one, all members of the group should have some background information or previous experience in the field. The group leader can see to this either by picking people with sufficient experience; or by sending out background and illustrative materials to group members in advance of the session.

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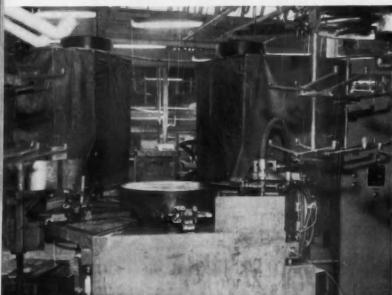
More Automatic Equipment for 1957 Buick Production

STEERING KNUCKLES



One of several special Davis & Thompson Rotomatic, 10-station drilling and tapping machines for machining Buick steering knuckles. Note the ingenious Y-shaped ducting for connecting to the electrical control panel; and the self-contained chip conveyor.

Merry-go-round Magnaflux inspection machine, first unit of its kind to be noted in 1957 production. The monorall conveyor in the foreground transports steering knuckles and steering arms to these machines. Steering knuckles may be seen in fixtures on the rotary Indexing table.



By Joseph Geschelin

INTRODUCTION of a completely new chassis for 1957 Buick cars has brought with it a realignment of many manufacturing departments as well as the acquisition of a large variety of new equipment. It is noteworthy that incident to the new equipment each individual line has been made more automatic and more highly mechanized to improve productivity. One of the important by-products of this activity is the promise of still higher quality levels, stemming from a reduction in manual handling.

One of the distinctive features of 1957 production is the addition of a fourth line of integrated equipment for machining cylinder blocks. Its inception marks a further advance in automaticity since the transfer of work from one section of the line to another now is accomplished automatically and without manual transfer.

Among the major changes in practice found in the axle plant are those incident to the change in design of the drive line. Last year Buick used a single long torque tube whereas the 1957 design employs a split torque tube with a long front section and a short, stubby rear section. Last year the torque tube was machined in one pass through a novel LeMaire transfer machine. This year Buick has three LeMaire machines of similar design for handling the front section alone.

The short rear section, on the other hand, is machined to fine dimensional tolerances as well as axial alignment in the 9-station, 15-head, pallet type Sundstrand

transfer machine illustrated here.

This is preceded by welding the two flange ends to a tubular section in a National submerged arc welder, using Lincolnweld heads. Immediately following this, the assembly is transferred to the Sundstrand transfer machines.

A distinctive feature of the machine is in the provisions for more accurate positioning of pallets at each station. This is accomplished in two ways. For one thing, the pallets ride on ways which serve only as guides. When a pallet has been accurately positioned at a station it is raised into clamping position by means of pins operated from below. In addition, the pusher type transfer bar mechanism is located over the pallets, engaging them at the top surface rather than from below. This too marks a departure from previous machine design.

The sequence of operations at each station is as follows:

Station	Operation
1.	Load
2. RH LH	Rough-bore large end, chamfer OD and ID Rough-face small end
3. RH	Rough-face large flange
LH	Idle
4. RH LH	Finish-face large flange Finish-face small end
5, RH LH	Drill six holes in large flange Drill four holes in small flange
6. RH LH	Chamfer six holes in large end Chamfer four holes in small end
7. RH LH	Finish-bore large flange Ream two holes in small flange
8.	Wash
9.	Unload

With the adoption of ball joint suspension at the front end, both the design and manufacturing procedures for making steering knuckles have been changed radically. Without going into the details of the entire setup, attention is drawn to two operations performed in Davis & Thompson Roto-Matics of different types. First of these is the familiar No. 8LV continuous drilling RotoMatic of vertical 8-spindle type. Here it is required to drill a two-inch diameter clearance hole in the central portion of the forging. This is done by continuous feeding of a two-inch drill during one revolution of the machine.

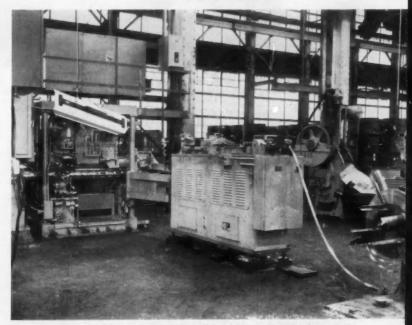
The rest of the machining cycle—drilling and taper reaming of two ball seat holes for ball joint

connections at the outer ends—is much more complicated and is performed in a Davis & Thompson 10-station, indexing type drilling and reaming machine, illustrated here. Since each ball seat is located at a different angle with respect

to the horizontal plane of the machine, the various heads are similarly positioned at the different stations in over and under locations.

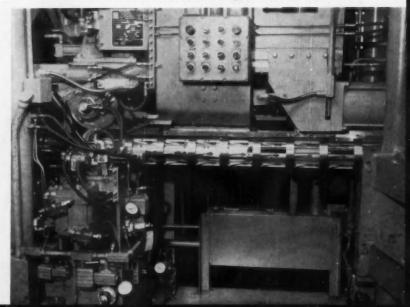
Each fixture on the indexing table holds two steering knuckles,

STATOR RINGS



Experimental setup for producing stator rings from strip stock in an automatic cycle. The operation starts with feeding of coil stock into the Sesce straightening rolls at the right, with cut-off in the background. At the first station of the welder in the background the strip is rolled into a full circle, then fed onto the large mandrel which traverses the bed of the machine.

Close-up of welding machine, shown above, depicting the rings moving on the mandrel to the National seam welding station at the left.





One of the 10 new Henry & Wright dieing machines installed in the press shop. Not only are they larger than the 40 mer type, they also feature air cushions mounted on the upper cross head. The view also shows the arrangement of Sesco coil reels and straighteners employed for the heavy stock.

loading and unloading being handled manually at the first station. The remaining operations may be listed as follows:

Station	Operation					
2	Drill lower hole 1/2-way through					
3	Drill upper hole 1/2-way through					
4	Drill lower hole through					
5	Drill upper hole through					
6	Spotface lower inner ball boss					
7	Rough taper-ream upper hole					
8	Rough taper-ream lower hole					
9	Finish taper-ream upper hole					
10	Finish taper-ream lower hole					

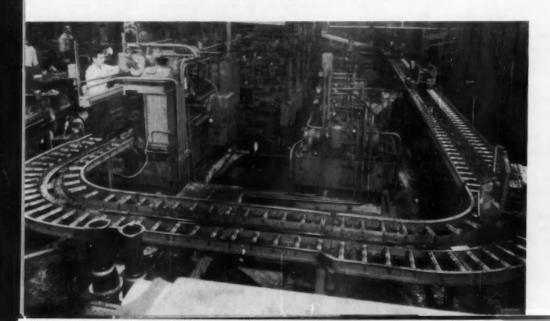
Steering knuckles as well as steering arms are transported by conveyor to final inspection. Because of the nature of the duty of these parts and the fact that they may be highly stressed, final inspection consists of two stages—dimensional inspection overall; and 100 per cent Magnaflux Magnaglo particle inspection to assure freedom from surface cracks and discontinuities that might cause fatigue failure.

Although our readers are quite familiar with Magnaglo inspection, the technique at Buick is distinctive, and marks the first use of a merry-go-round unit which is compact as to floor space and combines magnetization in two principal planes.

Buick has two of these inspection machines, one for steering knuckles,

the other for steering arms. The steering knuckle is placed manually in the fixture. With the movement of the conveyor the fixture first enters a magnetizing station and is coated with the fluid, then the work enters the first inspection booth for visual inspection. At this point the operator removes the part from the fixture, then replaces it in the fixture, permitting the part to go through the next magnetizing station and the second inspection booth. As the fixtures leave the second booth they pass through a demagnetizing station.

(Turn to page 123, please)



Perspective view of the Sundstrand transfer machine for machining the short rear section of the Buick torque tube. The conveyor system for handling the pallets for this machine may be seen circumscribing the entire installation.

Nickel-Chromium Alloy Extends Life of Salt Pot

HEN General Heat Treating Co. in Syracuse, N. Y., last needed a new pot for its neutral salts bath installation, metallized steel type that was widely used in the heat treating field at that time was purchased. It failed in only 640 hours.

This was not the first such failure. In fact, unpredictable and sometimes extremely short life of salt pots was the major problem associated with operating heat treating units of this type. Otherwise, the neutral salts process was well suited for hardening the ex-

Operator readies clutch disks and pressure plate levers for immersion in neutral salt pot

tensive line of automotive, aircraft and industrial components that were General Heat Treating's specialty.

In an effort to solve this problem, the metallized pot was replaced with one fabricated from Inconel sheet material. The new unit, was made by Ferrar & Trefts Div., Adsco Industries Inc., a Buffalo fabricator. It consisted of a sheet of ½ in. Inconel nickel-chromium alloy formed into a cylinder and welded. A dished, semi-elliptical head was welded to the cylinder to serve as a bottom for the pot. At the top, a mild steel flange was attached to the body.

Because sound joints were so important to performance, all welding was done with an inert gas shielded-arc-process and all seams were wire brushed between passes to remove oxide and promote soundness. As a final check on quality, all joints were inspected with X-ray equipment.

Operating at 16 hours per day, the fabricated Inconel pot lasted more than 2200 hours before it was removed from service. By watching how the pot gradually "necked-down" at the bath line, the operator was able to remove and repair the unit before any serious damage was done to the furnace or melt.

More than 100 fabricated Inconel pots have been installed to date. Service life varies with operating conditions, which, in the case of General Heat Treating, are unusually severe. The pot is in operation for 16 hours per day at about 1550F and then completely shut down for the remaining eight hours. These drastic temperature changes reduce service life. Thus, most operators prefer to idle the furnace several hundred degrees below operating temperature, which also shortens heating time when the unit is to be used.

Other users of fabricated Inconel Salt Pots have reported service life as high as 8000 hours. Operating costs which have normally averaged from 45 to 75 cents per hour are reduced drastically and, in some cases, are as little as 5 cents per hour.

Nuclear Congress to Study Uses of Atom in Peacetime

Peacetime uses of atomic energy will hold the spotlight at the forth-coming 1957 Nuclear Congress. Scheduled for March 11 to 15 at Convention Hall, Philadelphia, Pa., under the coordination of the Engineers Joint Council, it will be comprised of four major elements.

First, the Second Nuclear Engineering and Science Congress, sponsored by 20 engineering and scientific societies, will include 130 technical papers during a four-day program. Emphasis will be on new developments of potential value to civilian industry, especially in the fields of metallurgy, chemical processing, and mechanical and power application.

The National Industrial Conference

Board will hold its Fifth Conference on Atomic Energy in Industry, while the International Atomic Exposition will display industry's latest products in the atomic field.

Fourth element of the Congress will be the Fifth Hot Laboratories and Equipment Conference. It will deal with the operation and development of equipment for laboratories for atomic energy.

Can Airframes of the Future be Machined?

By J. H. Famme, Assistant Chief Engineer
Convair (San Diego) Division of General Dynamics Corp.

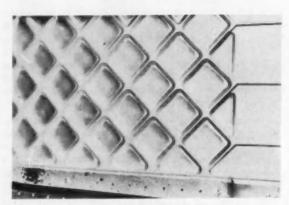


FIG. 1—Chemically milled test panel

NE of the biggest problems facing machine tool builders today is how to meet the ever-increasing close machine tolerances required by aircraft designers. Perhaps an explanation of the reason behind these tolerance requirements would be useful.

Closer tolerances result in less possible weight; less weight means increased performance. For instance, a long-range bomber requires 0.8 lb of fuel for each pound of aircraft weight. Save a pound of weight and you not only increase the speed, but you increase the range and have a better chance of completing the mission. An interceptor can obtain an additional foot of altitude with each pound of weight saved.

Each additional 0.001 in. per sq ft adds 0.0144 lb for aluminum alloys and 0.0413 lb for steel. Considering 100 sq ft of surface, this means 1.44 lb and 4.13 lb, respectively.

For a supersonic fighter with aluminum alloy skin and a wing area of 700 sq ft., upper and lower surfaces totaling 1400 sq ft, the maximum overweight penalty from the nominal thickness (in inches) could result as follows:

$$-0.000 + 0.010 = 202 \text{ lb}$$

 $-0.000 + 0.020 = 404 \text{ lb}$
 $-0.000 + 0.030 = 606 \text{ lb}$

-0.000 + 0.040 = 808 lb

This does not consider the milled areas of forgings and attachment fittings, since these are milled to specific tolerances and these weight values would have to be multiplied several times.

When the industry designs and builds an airplane

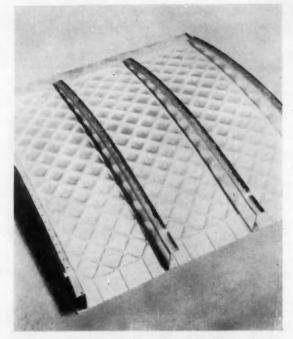


FIG. 2—Chemically milled, integrally stiffened skin

for speeds of Mach 3 to 4, alloy steel will form these aerodynamic surfaces. Then, we must take into account the overweight penalties that result from the use of steel alloy skin instead of aluminum on the same fighter:

$$-0.000 + 0.010 = 578$$
 lb $-0.000 + 0.020 = 1156$ lb $-0.000 + 0.030 = 1734$ lb $-0.000 + 0.040 = 2312$ lb

Considering a bomber with a wing area of 2000 sq ft, one can see that the weight problem becomes serious with extreme tolerance conditions. In fact, if the wing skin material were to be delivered on the high side of the tolerance, the weight of a modern bomber would be increased approximately 5000 lb. This would mean a 50,000-lb increase in weight to cover the power plant, structure, fuel, and so forth, needed to fly that additional 5000 lb at the same speed, range and altitude.

It can be seen on the basis of these figures that

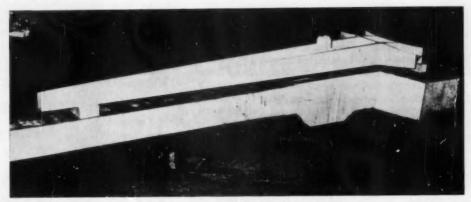


FIG. 3-Blocker forging and machined fitting

even closer tolerances will be specified in the future. That means a greater machining problem. More important, it means that more equipment and heavier equipment will be necessary if machining is to continue in the same manner.

New Materials

New materials will be necessary if we are to overcome the thermal barrier. What determines the selection of materials? Properties to be considered come under two major classifications: (1) Mechanical—Ultimate strength, yield strength, modulus, elongation, impact value, creep, etc. (2) Physical—Density, thermal expansion, conductivity, etc.

A third big factor also should be considered, one which is just as important as the preceding two. This is corrosion, fatigue and temperature resistance of the surface.

Corrosion, fatigue, and temperature resistance make up a surface phenomenon which is not too well understood, but it is the fourth dimension of materials and will have an impact on the machine tool industry. It is the condition of surface finish that will affect the machine toolers—not only the surface finish requirement, but the means employed to obtain the specified finish. A metal's fatigue strength depends on the physical and mechanical properties of its outer fibers. Corrosion and high temperature resistances in many metals is the function of the surface created by the metal in its environment.

Other related factors also determine material selection. These are:

Cost and Availability. These two are grouped because for aircraft construction, availability in the case of an emergency is of utmost importance. Cost per pound is not too important if the material saves weight, since material costs are a small portion of the overall cost of an aircraft.

Reliability. The material must meet the service requirements of the intended application. One would not use magnesium for skinning of a flying boat where protection of the magnesium from sea water

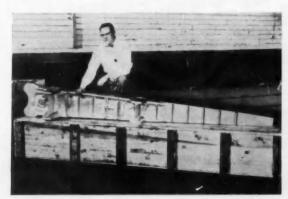


FIG. 4—Heavy press rough forging, 10-ft length spar

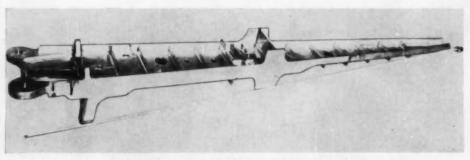


FIG. 5—Heavy press finished forging, 10-ft length spar

attack is extremely difficult. In other words, magnesium in sea water is not reliable.

Producibility. Can the present equipment and technique be used for forming and joining of the material? Heat treatable alloys are desirable because the forming may be accomplished in the soft condition and higher strength properties gained by heat treating after or during forming. High-strength magnesium alloys, for example, cannot be heat treated. Their properties are gained by cold working and, once lost, cannot be restored during fabrication. Heat treatable titanium alloys are now being considered. We have great expectations of finding an alloy that can surmount the heat and producibility barriers and still give us a material which we can form.

Machine tools must be able to remove material, and they must be able to do this without destroying the mechanical properties of the remaining surface. Physical properties can be restored by treatments but mechanical defects cannot always be remedied.

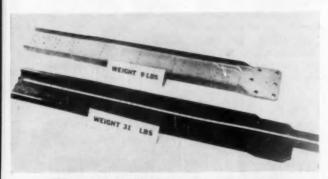
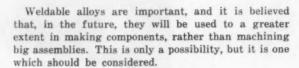


FIG. 6—Titanium forging, rough and machined



New Processes

The chemical milling process patented by the North American Aviation Corp. at Downey, Calif., is a remarkable application of a process that has been familiar to everyone for years, the removal of metal by etching with chemicals.

Examples of chemical milling are shown in Figs. 1 and 2. The first shows a chemically milled test panel; the second, a chemically milled, integrally stiffened skin.

Chemical milling is applicable to forgings only in conjunction with considerable machining because of the variable nature of the tolerances involved.

Mention of chemical milling is made in passing to indicate a need for radical means of machining. We need a miracle of sorts to overcome incremental metal removal. Making chips is an expensive operation, and the product is of no intrinsic value. A good end use chips is in order because the aircraft industry produces more chips—both in quantity and in weight—than it does parts.

Forgings

The idea of saving machining time was one of the big reasons for the popularity of forgings. There were two other reasons—forgings eliminated combined multiplicity of pieces and had good strength-weight ratio. Forgings originally were intended to be used just as forged, except for the machining of attachment areas. After World War II, a survey team noted the German

(Turn to page 114, please)

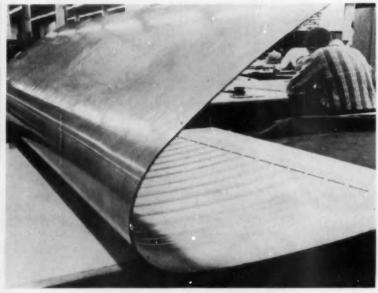


FIG. 7-Leading edge, chemically milled

TABLE I CHEMICAL MILLING TOLERANCES

Dimension Depth (in.)	Tolerance (in.)
0.000 to 0.030	0.604
0.031 to 0.060	0.005
0.061 to 0.090	0.006
0.091 and up	0.008
Length and width	0.120
Fillet radii are enual te depti	h of etch.

TABLE II ALUMINUM FORGINGS TOLERANCES

Tolerance	Forging	Weight
	1 16	100 lb
Die closure (thickness)	0.064	0.210
Longth and width to 8 in.	0.048	****
Length and width to 5 ft	****	0.360
* Miematch	0.015	0.060
* Straightness length, 9 in.	0.016 length,	60 in. 0.125
* These are additive to the previous	tolerances.	
Draft angle (deg)	3 to 7	3 to 7
Corners and edges (approximate)	0.000	0.250
Elliota (anneavimata)	0.280	2 000



Chevrolet's New Engineering Center

By H. F. Barr, Chief Engineer
Chevrolet Motor Division of General Motors Corp.

Advanced equipment in a fuel flow test room checks a fuel injection system. Vacuum of an engine's cylinder is duplicated by the equipment while gages register performance



One of the Engineering Center's 18 dynamometer rooms. Operating conditions of every kind can be simulated with the equipment provided.



EOGRAPHIC location of the new Chevrolet Engineering Center is excellent, with resources of the General Motors Technical Center (situated in Warren, four miles north of Detroit) virtually at the back door. Chevrolet engineers have daily contact with their facilities in styling, advanced research, staff engineering and process development. In addition, body engineering programs are greatly expedited by the convenient location of Fisher Body engineering and central offices.

In this age of highly technical engineering activity, it is necessary to work on future models concurrently, for at least a three-year period. This means that with '57s now on the streets the 1958 model is well along in its release program for tooling, and the designs for '59 are established with long lead time components being released for machinery procurement. Program planning for 1960 is under way and model years 1961 and 1962 are receiving attention from Chevrolet's advanced design groups.

It is no longer possible to design, test, and develop new cars and trucks one model year

(Turn to page 102, please)

A Chevrolet chassis frame is checked for deflection at 42 points in this setup. For this rigidity test, a load of 1500 lb is placed behind the front cross member. In making tests to determine ultimate strength, frames are loaded with as much as 7500 lb.

attack is extremely difficult. In other words, magnesium in sea water is not reliable.

Producibility. Can the present equipment and technique be used for forming and joining of the material? Heat treatable alloys are desirable because the forming may be accomplished in the soft condition and higher strength properties gained by heat treating after or during forming. High-strength magnesium alloys, for example, cannot be heat treated. Their properties are gained by cold working and, once lost, cannot be restored during fabrication. Heat treatable titanium alloys are now being considered. We have great expectations of finding an alloy that can surmount the heat and producibility barriers and still give us a material which we can form.

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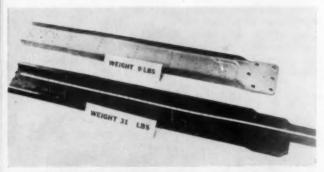
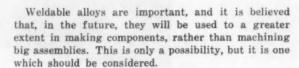


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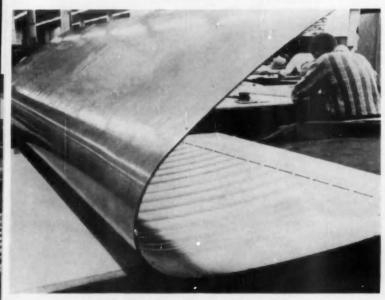


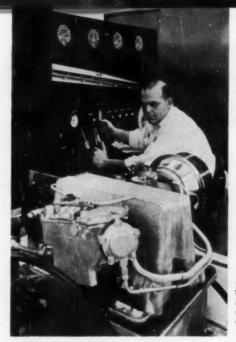
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Chevrolet Motor Division of General Motors Corp.

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AUTOMATIC CONTROLS PRODUCTION—VEHICES—AIRCRAFT

By Samuel Cummings

MACHINE TOOL CONTROL

The aircraft industry is taking a closer look at automatic machining these days. The trend is being sparked by the need for meeting the more exacting requirements of supersonic flight.

The increased use of heavier weight metals, such as titanium and steel, for example, may mean reduced airplane performance unless weights can be trimmed by more precise manufacturing methods. One way of keeping weight down would be to achieve closer machine tolerances by applying numerical control to machine tools.

Moreover, according to the Aircraft Industries Association of America, time required for the production of aircrafts parts can be greatly reduced by the use of machine tools operated by electronic brains. In a recent investigation of the possibilities of automatic machining, the AIA Airframe Manufacturing Committee found that in one plant more than 100 hours were being saved in the production of a single plane part by the application of numerical control.

In another plant, an aluminum profile part that once took 23 days to produce on conventional machines was planned, programmed and turned out in less than half a day. A conventional tracer machine produced this part in $3\frac{1}{2}$ hours. Using numerical control, the part was machined in only 14 minutes—and with far greater accuracy.

Other advantages listed by the AIA investigating committee were: lower production costs, reduced time in converting from engineering drawings to finished parts, and elimination of tracer template storage.

Some aircraft companies have already made a modest start in the direction of more automaticity. At Bendix Aviation Corp. numerical control was introduced about five years ago with the development of a cam milling machine. The job of this machine

is to turn out prototype models and production masters of three-dimensional cams for use in automatic fuel control systems for jet aircraft engines. The cams are cut to an accuracy of 0.002 in.

The latest Bendix venture into numerical control is a general-purpose, three-axis milling machine which was described recently by Robert C. Sims, of Bendix, at the American Institute of Electrical Engineers Conference on Machine Tools.

Information for controlling the machine is punched in blocks on plastic tape, and each block controls the machine in a straight-line path from one point to the next. Curves are cut by the straight-line approximation method to any desired accuracy within the scope of the machine tool itself.

Basic input to the servo drives are voltage pulses, each of which commands a travel of 0.0002 in. Command information on the tape consists of binary numbers corresponding to the number of command pulses that must be delivered to each axis to drive the cutting tool. Feed rate information is also punched on the tape.

Servo feedback devices provide signals to the machine control unit, which electronically converts them to pulses. The machine control unit senses the difference between command pulses and feedback pulses for each axis and provides proportional signals to the servo drives to reduce the difference toward zero.

The machine is part of a system, which includes tape preparation equipment, the electronic machine control unit, and high-performance hydraulic servo drives for the machine tool. Because of the complexity of tape preparation in this system, a special Bendix computer and two tape handlers are included.

North American Aviation, Inc. has developed a new and versatile tape control system called Numill that can be used to automate many kinds of machine tools, such as lathes, boring mills, contouring mills, and grinders.

The Numill controls are presently being applied to a standard Cincinatti vertical Hydro-Tel milling machine, which automatically performs hole-drilling, scribing, and contour-milling operations. The control consists of a display panel, a control pendant, measuring gages, and a tape reader console.

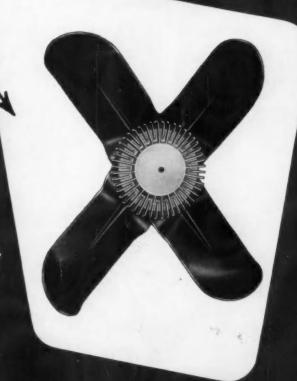
The display panel gives the operator the necessary setup information, such as size and type of material and cutters, and machine speeds. The control pendant allows the operator to control the machine manually, whenever necessary.

The tape reader translates digital information from the magnetic tape into command pulses, involving either position or path control. Each pulse causes the machine slide to move 0.0005 in. The digital measuring gages sense machine movements and translate them into "add or subtract" feedback pulses, also representing 0.0005 in. of machine movement. Both command and feedback pulses are continuously compared and any deviation from the desired movement results in a signal to adjust the hydraulic

(Turn to page 116, please)



Announces Modulated Fan Drive



New Horsepower Saving New Hushed Operation New Increased Cooling New Simplicity

THOMPSON PROD



New Thompson plant now in operation.

9t's open NOW!

Thompson's new, modern automotive parts manufacturing facility

ALREADY production is humming in Thompson's brand-new parts-manufacturing plant just opened at 34201 Van Dyke, Warren (Detroit), Michigan. This completely modern facility is employing the latest methods and equipment available to provide low-cost, most efficient manufacture of chassis parts.

Chassis design improvement has become an increasingly important factor in the automotive industry's future planning. This, plus the tremendous acceptance of Thompson steering linkage and other chassis parts has made Thompson's latest expansion necessary.

Finer steering linkage and suspension parts, new and advanced manufacturing techniques, better customer service—these are but some of the advantages that Thompson offers you.

Have your engineers call on Thompson to help develop your steering linkage and suspension. Write, wire or phone Thompson Products, 34201 Van Dyke, Warren, Michigan.

Thompson Products

Michigan Division: Detroit . Portland



both sides of turbo-jet engine discs profile-faced simultaneously with new WICKES center drive facing lathe

The Wickes CDF Series Machines represent a new concept in machining that offers advantages never before possible. Equalized pressure of cutting tools on opposite sides makes for extreme accuracy. Spindle speed control for constant surface speed at any pick-off diameter.

Six machine sizes available for machining discs ranging in diameter from 14" to 44". Constant cutting feet per minute plus uniform feed per revolution produce a highly superior finish. Single chucking eliminates stack up of tolerances. Stainless steel or titanium readily machined.

Controlled by 360° tracer. Developed by the pioneers of the center drive principle . . . proved in actual operation. For more detailed information on this machine write us today.

WICKES



WICKES

MACHINE TOOL DIVISION

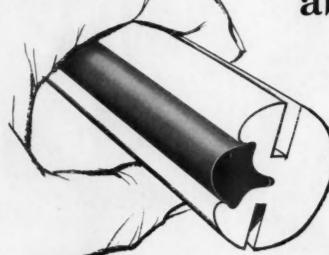
THE WICKES CORPORATION . SAGINAW, MICHIGAN

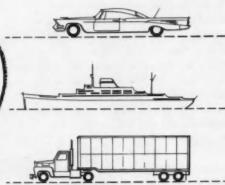
OVER 100 YEARS' EXPERIENCE IN SOLVING PRODUCTION PROBLEMS

Everybody talks about the weather, but . . .

Inland's Filler Strip

does something about it!



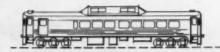


Weather doesn't have a chance against Inland Self-Sealing Weather Strip, and for good reason. It's leakproof.

Inland's patented filler strip is the secret. It is easily, quickly inserted into a small channel inside the seal. This increases the overall compression of the seal—after seal has been installed—giving permanent, positive protection against every extreme of weather. Does away with special moldings, binders, channels or messy, unreliable cements.

Inland Weather Strip's many standard sizes and shapes fit a wide variety of installation dimensions. Can be specially designed to fit any installation and service requirement. Get more information on Inland Self-Sealing Weather Strip now.





INLAND

self-sealing weather strip



INLAND MANUFACTURING DIVISION

General Motors Corporation, Dayton, Ohio

Performance Records Prove Eaton Free-Valves DO Last Longer!

CONVENTIONAL VALVES

Failure unpredictable—anywhere between 5,000 and 40,000 miles. Impossible to set up dependable preventative maintenance schedule.

EATON FREE-VALVES

Still in good condition after 100,000 or more miles, permitting preventative maintenance scheduling. No in-between servicing necessary.



The Eaton Free-Valve is free of any restraining force set up by the valve spring. The normal creeping tendency of the valve causes it to take infinitely variable positions with respect to the seat at successive lift cycles.

The common goal of valve and engine manufacturers—and truck operators—is to obtain valve life equal to that of other major components, thereby eliminating the necessity for valve servicing between major overhauls. Performance records covering millions of miles of heavy-duty operation prove that Eaton Free-Valves have achieved this goal.

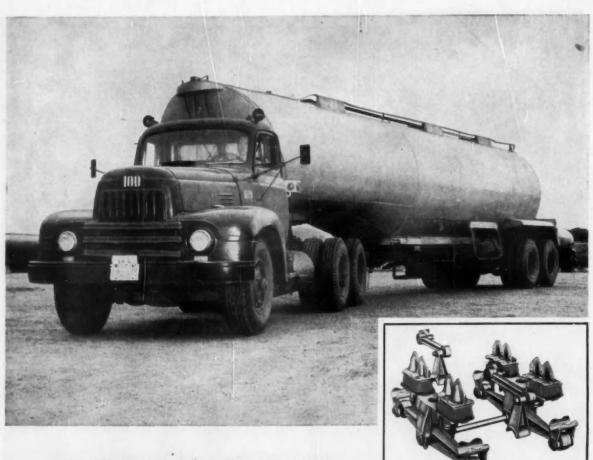
Eaton Free-Valves are genuinely "free"—free to turn at random in either direction, during a major portion of the lift-cycle. This free-floating action wipes stem and seat free of deposits; keeps a film of oil on stem and guide surfaces. Scuffing is prevented, wear is reduced. Hot-spots due to local leakage are eliminated. Longer valve life is a natural result.

Our engineers will be glad to explain how Eaton Free-Valves can be applied to engines of all types and sizes.

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PRODUCTS: Sodium Cooled, Poppet, and Free Valves . Tappets . Hydraulic Valve Lifters . Valve Seat Inserts . Jet Engine Parts . Rotor Pumps . Motor Truck Axles . Permanent Mold Gray Iron Castings . Heater Defroster Units . Snap Rings . Springtites. Spring Washers. Cold Drawn Steel . Stampings . Leaf and Coil Springs . Dynamatic Drives, Brakes, Dynamometers



ENJAY BUTYL "LOAD CUSHION"

The unique design of the "load cuahion" accounts for smooth, even rides in the full range of loads, empty to full. Enjay Butyl Rubber (in red) made it possible.

replaces steel springs in big Tractor Trailers

The "load cushion" is an important innovation in tandem suspension. Developed by the Hendrickson Mfg. Company, it is made of Enjay Butyl and replaces steel leaf springs. Utilizing the great strength and impact resistance of Enjay Butyl, the "load cushion" gives the ultimate in a soft, easy ride within the complete range of loading, from empty to full. Besides giving a smoother, steadier ride, it increases tire mileage, reduces weight and significantly reduces wear and tear on equipment.

Enjay Butyl has proved to be the answer to problems in many fields of industry. It may well be able to cut costs and improve the performance of your product. Low-priced and immediately available, Enjay Butyl may be obtained in non-staining grades for white and light-colored applications. Get all the facts by contacting the Enjay Company. Complete laboratory facilities and technical assistance are at your service.



Pioneer in Petrochemicals

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Enjay Butyl is the super-durable rubber with outstanding resistance to aging • abrasion • tear • chipping • cracking • ozone and corona • chemicals • gases • heat • cold • sunlight • moisture.

News of the

MACHINERY INDUSTRIES

By Thomas Mac New

Numerous Mergers
Were Completed within
the Machinery Industries
During 1956. Machine
Tool Volume Was Close
to the \$1 Billion Mark
for the Year.

Bendix Buys Sheffield

Bendix Aviation Corp. officially took over the business and assets of the Sheffield Corp., Dayton, O., the last week in December.

The original announcement of the contract was made concurrently in Detroit by Malcolm P. Ferguson, Bendix president, and in Dayton by Louis Polk, president of Sheffield.

Ferguson said that to acquire the Sheffield business Bendix issued approximately 230,000 shares of its common stock. Sheffield will continue to operate under its present management as a wholly-owned subsidiary of Bendix.

Sales of Sheffield, which was a privately-owned company, on an annual basis are currently running approximately \$24 million, having risen from \$1 million 16 years ago. Sheffield will retain its identity and its product brand names. Mr. Polk will become a director, vice president and group executive of Bendix and will continue as president of the Sheffield subsidiary.

Ferguson described the merger of the interests of the two companies as "a logical and promising move in Bendix growth program to help meet the needs of industry for more efficient gaging and measurement control systems, and for automation-type equipment." He said that by joining forces with Sheffield it will be possible for a number of promising engineering developments now under way in Bendix divisions to be more effectively marketed.

"Also," he said, "we are further broadening the scope of our manufacturing activities which already include more than 350 basic products."

In announcing the agreement to his employes, Polk said, "We have chosen to work out this agreement with Bendix in order to equip our organization with the greatly expanded facilities, engineering, management, production and financial resources we must have in order to meet the largest projected growth opportunities in our history, and to serve our present and potential customers more efficiently."

Sheffield operates plants in Dayton, Cleveland and Fostoria, O.; Greenfield and Conway, Mass.; Mount Clemens, Mich.; Windsor, Canada; and Melbourne, Australia.

Sheffield headquarters, main plant and research laboratories, including its new Eli Whitney Metrology Lab oratory, will remain in Dayton.

The Eli Whitney Laboratory is the first independent industrial facility in the U. S. completely equipped to assist industry in solving basic gaging and dimensional measurement problems to a precision of millionths of an inch. Through the laboratory, Sheffield has expanded its close collaboration with the Bureaus of Standards, both of the U. S. and foreign governments in helping to improve precision manufacturing standards and in achieving finer absolute measurement techniques and methods.

The Year in Retrospect

Business conditions were rather good throughout the entire machinery industries during '56. Machine tool volume hit close to the \$1 billion mark. Tool and die shipments were reported as considerably higher than \$800 million. Conveyor sales were in the neighborhood of \$300 million. U. S. industry, in general, spent about \$36 billion for capital goods and plants during the year.

1956 has also been a year of expansions and mergers within the machinery industries. Both small and large companies have been acquired to give firms a stronger competitive position within the industry or to diversify product lines. More machinery companies are expanding or modernizing present facilities to meet increased sales and to cut costs.

To start the ball rolling in January '56, Pratt & Whitney Co., Inc., purchased Sterling Die Co. of Cleveland. Ex-Cell-O, at approximately the same time, announced the purchase of two new manufacturing sites—Elwood, Ind., and Downey, Calif.

Pratt & Whitney also bought Jaquith Carbide Die Corp., of Lynn, Mass., and it was reported later that P&W plans to spend millions for expansion to handle its increase in busi-

Ex-Cell-O set up a new engineering office in Toledo. The company also acquired Cadillac Gage Co. of Roseville, Mich., and the Smith Bearing Co. of Trenton, N. J., just last month. Both companies will operate as whollyowned subsidiaries.

Chambersburg Engineering Co. opened its new \$1 million foundry.

Sheffield Corp. purchased Erwin A. Slate, Inc., a sales and service company. Now, as mentioned, Bendix Aviation Corp. has purchased the assets of Sheffield.

Giddings and Lewis Machine Tool Co. reorganized into a divisional setup with G&L Hypro and Davis Boring Tool in Fond du Lac, Wis., Cincinnati Bickford, in Cincinnati, and Kaukauna Machinery and Foundry Div. in Kaukauna, Wis. Davis Boring Tool Div. of G&L purchased Kelly Reamer Co. and transferred operations to the Davis plant.

Detroit Broach & Machine Co. started enlarging its Rochester, Mich., plant.

Pines Engineering bought Roto-Mation Motors, Inc., and changed the name to Roto-Mation Inc., with offices in Greenville, Ohio.

Hammond Machinery Builders, Inc., took over the Grand Rapids line of drill and tap grinders from Gallmeyer & Livingston.

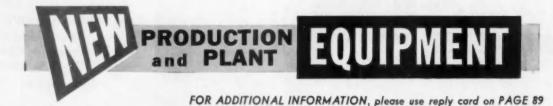
Motch & Merryweather Co. got out of the gardening tool business by selling its Triple M Products Div.

Acme Aluminum Alloys, Inc., decided to manufacture special tools and machines.

Bullard Co. put the "open for business" sign on its new \$7 million foundry. The company also just announced the acquisition of the Hydra-Feed lathe line from Hydra-Feed Machine Tool Corp. Operations are being transferred to the Bullard plant.

Frank B. Stallings of Cleveland acquired the machine tool and pedestal grinder lines of Bradford Machine

(Turn to page 120, please)



Sundstrand universal bed type milling machine with all-angle head

Universal Bed Type Milling Machine

RECENTLY added to the Rigidmil series, a universal bed type milling machine combines longitudinal feed of the table, cross feed of the column, and vertical feed of the head. These feed motions are provided by motors independent of the spindle motor, which thus supplies its full output to the spindle. The machine, as illustrated, has an all-angle ram type head. This head is adjustable through an arc of 360 deg both parallel and crosswise to the machine table, to give practically any cutting angle desired. When not in use, the head can be retracted to clear the horizontal spindle.

Twenty-four speed changes are available on both the horizontal spindle and the all-angle head in a range from 14 to 1450 rpm, with changes made from a selector switch on the control pendant. On the main spindle the horsepower range is one per rpm up to 50 hp max, and on the all-angle head it is ½ hp per rpm up to 20 hp max.

With fixed height bed design, the cutter is positioned to the work for convenience of loading large workpieces and easier observation of cutting operations. Bed type design also makes possible the use of a wider table and longer table feed strokes.

Feed movements are infinitely variable (within the machine range) with control switches on the pendant for selection of the feed desired. The machine is equipped with vernier scales for table, column and head positioning. It has been designed with mechanical screw feeds for application of controlled tracing and programming. Sundstrand Machine Tool Co.

' Circle 30 on postcard for more data

Pilot Plant Furnaces

Furnaces especially designed for pilot plant operations requiring the testing and determination of methods and processes for heat treating and melting of metals, are contained in a line recently introduced. Company engineers say that with this equipment manufacturers can set up practical and controllable procedures for determining individual requirements for products and parts.

The present line comprises six units as follows: An atmosphere box furnace 6 by 12 by 5-in. for continuous operation at 2600 F; box furnace 5½ by 7½ by 14¼-in. with reactor control; a 3-kw high frequency induction furnace; a horizontal tube furnace; a vertical tube furnace 5-in. oD by 8-in. effective; and a high temperature pot furnace for operation to 2500 F. Lindberg Engineering Co.

Circle 31 on postcard for more data

Brakemotors

B RAKEMOTORS that stop quickly and hold heavy loads have been introduced in a new line which is said to give long trouble-free operation on all types of equipment, including heavy-duty cranes. Features include a wide torque range from 3 to 345 lb-ft, one-piece molded friction linings, and one-operation torque setting. In the event of power failure or low voltage, "deadman" operation sets and holds the load until normal operation is restored. The design incorporates a minimum of wearing parts, and any adjustments may be performed with ordinary tools by removing the brake housing and lifting out the operating mechanism.

Various types of enclosures are available, including those suitable for



Reliance Brakemotor

outdoor installation or where extremely moist, corrosive, or abrasive dust conditions exist. Standard enclosures include protected, totally-enclosed non-ventilated, totally-enclosed fan-cooled, and explosion-proof class I, group D and class II, groups E, F, and G. Reliance Electric & Engineering Co.

Circle 32 on posteard for more data

Live Pilot Bushing

Being offered as a replacement for the bronze bushing in the outer support on horizontal boring mills, a one-piece live pilot bushing is said to increase accuracy by maintaining a close fit of bushing and bar without play or chatter. It is also stated that tool life is increased, and that more accurate heavier cutting can be performed at higher speeds.

Each live pilot bearing bushing is tailor-made to individual boring mill specifications. Various sizes of boring bars can be used by reducing-down with adapter bushings. The only moving parts are two sets of tapered roller bearings which provide radial

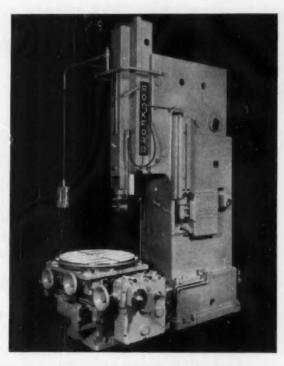


Donley one-piece live pilot bushings

and thrust support and friction-free action. It is reported that a maximum assembled bearing runout of 0.0005-in., plus a dead center method of grinding the body diameter after assembly, eliminates cumulative build-up of eccentricities. Complete sealing against coolants, grit and dust assures long life. The bushings can be adapted to receive removable slip bushings or to receive keys or keyways. Donley Products, Inc.

Circle 33 on postcard for more data

Rockford 36-in. stroke Model SA Hy-Draulic stotter fe a fur es a unique combination of mechanical leverage and hydraulic control for the ram drive. Patented torque arm drive permits infinitely variable speeds between 40 fpm and 100 fpm for increased efficiency in cutting a range of materials.



Heavy-Duty 36-Inch Stroke Hydraulic Slotter

Now being manufactured is a 36-in. stroke hydraulic slotter, designed for handling large awkward work, irregular sections, internal surfaces, and angular and rotary cuts. The machine features a unique combination of mechanical leverage and hydraulic control for the ram drive. The patented torque arm drive permits an infinite speed adjustment from 40 to 100 fpm with constant horsepower characteristics. Speeds below 40 fpm are available by means of a flow control valve.

Machine controls are conveniently

located in relation to the operator. Cutting speed and all power movements for the machine are controlled at the overhanging pendant. A cutting indicator on the column indicates the approximate ram speed being used. Start and stop levers are installed on both sides of the column.

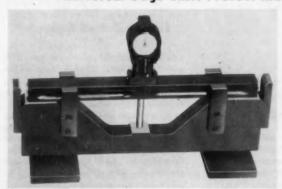
The machine has wide-range longitudinal and transverse table travel, plus 360 deg rotary table movement. A dividing head provides for the accurate spacing of keyways, serrations, gear teeth and other work requiring precision indexing.

Other stated features include power rapid traverse in all directions, stroke length adjustment while the ram is in motion, and a mechanically-balanced ram with a tilt of 10 deg from vertical. Positioning of the ram involves but three steps: (1) angular position of the ram; (2) height of the ram as established by position of the ram housing in relation to the table; and (3) length of ram stroke.

A 15-hp variable delivery, radial piston pump is used for hydraulic power. Electrical equipment is standard, single direction, with conventional control. Automatic pressure lubrication is provided for the ramways, the bed-ways and the saddleways. Rockford Machine Tool Co.

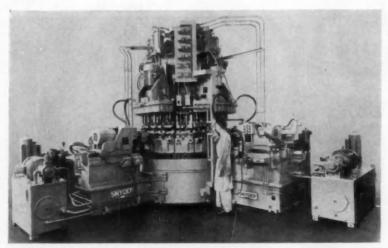
Circle 35 on posteard for more data

Universal Gage Units Protect Indicators



Featuring full protection of dial indicators, rugged construction, and versatility in application, a line of universal gage units is said to give accurate repeat readings. The unit illustrated applied as a depth gage, is on a 14-in, central base and stored on a 14-in, unster used for the dial indicator. (Hanlo Gage Co.) Circle 34 on posteard for more data

PRODUCTION EQUIPMENT



Snyder center-column machine produces 331 steering gear ball nuts per hour

Center Column Machine for Steering Gear Ball Nuts

REATURING a special heavy-duty seven-sided column that resists high machining thrust loads, a 16-station center column machine drills, countersinks, chamfers and reams steering gear ball nuts at the rate of 331 pieces per hour. The machine, which is one of the largest of its type ever built, has a 96-in. diam index table. With its control panel, it occupies a 24-ft by 26-ft floor space and its 13 ft high overall. Weighing about 50,000 lb, it develops a total of 181 hp.

Three SAE 5620, 2½-in. long steel ball nuts, having a 1% by 1%-in. round-corner square section, are clamped in each of the 16 fixtures on the machine. The nuts, which have previously-machined rack teeth in the blanks, are located in the fixtures from these rack teeth. Hydraulic clamping means are provided for the parts.

The operation sequence follows: In the 2nd station two recirculating ball holes are spot-drilled on the radius corner of the part by a vertical head. These holes are drilled to a depth with a vertical head in the 3rd station, and a %-in. hole is drilled one-third through the part with a horizontal head in this station. The two ball holes are flat-bottom drilled in the 4th station. In the 5th station a small hole is tap-drilled with a vertical head, and the %-hole is drilled two-thirds through with a horizontal head. The operations in the 6th, 7th and 8th stations are performed with vertical heads on another ball hole, and the %-in. hole is drilled through with a

horizontal head in the 7th station.

The fourth ball hole is spotted, drilled and flat-bottom-drilled in the 9th, 10th and 11th stations with vertical heads. The %-in. hole is enlarged with a core drill on horizontal heads in the 9th and 12th stations. The tap-drilled hole is chamfered in the 13th station. The recirculating ball nut holes are radius-chamfered with vertical heads, two holes being chamfered in the 14th station and one in the 15th and 16th stations. The core-drilled hole through the part is back-chamfered with a horizontal head in the 14th station. This hole is reamed to finish size with a horizontal head in the 15th station. Snyder Tool & Engineering Co.

Circle 36 on postcard for more data

Screw Machine Tap

M ADE specifically for use in screw machines, a new stub tap is said to incorporate features which eliminate most of the tapping difficulties encountered when using conventional taps in screw machine operations. Stated features are a necked shank for generous lubrication; a spiral point to reduce torque and improve chip disposal; and a short thread length to counteract the tendency to produce bellmouth threaded holes because of misalignment.

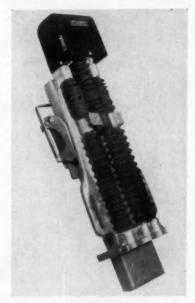
It is available from stock in highspeed steel ground thread, NC or NF, plug or bottoming chamfer, in Nos. 2 to 10 machine screw sizes, to GH2 limits. Pratt & Whitney Co., Inc.

Circle 37 on postcard for more data

Compound Applicator

An air-operated buffing compound applicator that permits the application of 10-in. of compound without resetting or adjustment, has been announced. Designated as the Model 1006, it can be installed on all types of buffing machines from simple lathes to multi-operation automatics. Lightweight construction, less than 24 lb, is said to permit installation on floating heads without disturbing balance. It can be installed in any position without affecting operation.

A stated feature of the applicator is its ability to feed any number of strokes per minute, applying compound only when required. For example, it can be installed so as to apply compound only during the buffing cycle, withdrawing while the work changes from station to station in the machine. In addition, it is also possible to operate up to eight applicators simultaneously from a single control valve, applying compound uniformly to all buffs. With each application, the compound is fed forward to compen-



Nankervis automatic buffing compound applicator

sate for "wear-down" of the bar. The rate of feed is adjustable from 0.0015 to 0.015-in. per stroke.

Major parts of the applicator are fabricated of cast aluminum to minimize overall weight. All operating parts are covered to seal out dirt, wheel lint and compound. Moving parts are bearing-mounted for trouble-free service and smooth operation. George L. Nankervis Co.

Circle 38 on postcard for more data

Press Stock Feeders

Combination coil cradles and straightening machines for feeding leveled stock to all types of presses are now being offered in a new complete line. They can handle stock weighing up to 15,000 lb, with 6, 7 or 9 rolls provided for straightening, according to model. A standard manually -controlled variable-speed drive, with 4:1 reduction, permits selection of feed speeds from 30 to 120 fpm.

The loop control used reduces to a few feet the distance between cradle and press without interfering with die handling and press service. The variable-speed drive operates continuously, synchronized with the press. The loop control arm is geared to the drive to advance or retard stock feed to match the rate that stock is used by the press. Hard alloy steel leveling and pinch rolls are used. The lower rolls drive through heavy spur gears; all upper straightening rolls are adjustable individually or as a group. Pinch rolls are supplied in one or two sets, depending upon the material used. A manual release lever is provided for instant opening or closing of pinch rolls.

The cradle has adjustable guide plates which rotate with the coil, protecting edges of stock. It is loaded by lowering the coil by hoist, or with coil storage cars or loading racks. For loading by the latter two methods, the cradle is equipped with an air cylinder to ease the coil into place.

The 2000-lb coil cradle and straightener features a rotating bar support mounted on roller bearings, and is said to be suited for handling aluminum, brass and stainless steel coil. It will take stock up to 36-in. OD, 14-in. wide and 0.093-in. thick. A set of pinch rolls on the input side of the straightener draws stock from the reel. The Brandes Press Co.

Circle 39 on postcard for more data

Rotary Belt Grinder

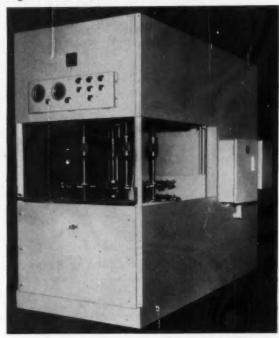
An automatic rotary, platen-type, abrasive belt grinder, recently introduced for OD grinding of ferrous and non-ferrous metals, plastics, ceramics, glass and other materials, is designed to handle circular parts from 26 to 40-in. diam. It can be modified to meet other diameter

The motor-driven work table rotates at standard speeds of either % or 3 rpm, with optional change gears for other rpm requirements. An air-

Finishing Process for Die-Cast Parts

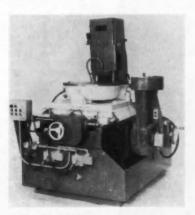
Utilizing the machine illustrated, a mechanical finishing known as Spin-Finish is said to promise a ma jor change in methods finishing brass, zinc-base and aluminum die-cast parts preparatory to plating. A multiple mounting of parts is finished in a single automaticallytimed operation, using a dry compound. Parts fixtures are mounted on four double-action revolving spindles. Operating cycle varies from 4 to 16 min. Dust and fume - free, blowers or ventilating systems are required. Parts camplex in shape can reportedly be handled in one operation. (Grav - i - Flo Corp.)

Circle 40 on postcard for more data



controlled infeed mechanism carries the rotating parts in against the belt, and infeed travel is adjustable to a minimum of 0.0016-ipr. To give even distribution of belt wear, the parts are moved back and forth across the belt face by means of an air-hydraulic reciprocating device, with seven-inch oscillation stroke. The table is adjustable from 0 to 45 deg for angular grinding.

For applications requiring deburr-



Engelberg Huller rotary belt grinder

ing, such as stator rings or bucket wheels, a tampico brush attachment is provided as an optional attachment. The brush is moved in against the belt-ground work by a manual control wheel, and can be swiveled to coincide with grinding angle of machine table.

Standard abrasive belt size is 8 by 107-in., with belt speed available from 2000 to 5000 sfpm, depending on application. Capacity of coolant unit, equipped with ½-hp coolant pump, is 100 gal.

This grinder is 70 in. long, 70 in. wide, and 76 in. high, and is powered by a 10 hp motor. Engelberg Huller Co.

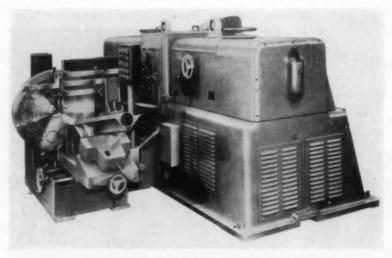
Circle 41 on postcard for more data

Hydrogen Embrittlement

As a guard against hydrogen embrittlement, a marking material called Tempa-Dot has been introduced for use on heat treated parts that have been electroplated, pickled or phosphate coated, to give a visual indication that each part has been baked to relieve hydrogen embrittlement. Upon application it appears as a vivid red dot, changing color after the proper bake. Its color reaction is said to be sufficiently accurate to show a ±25 F deviation. The material is packaged in spot applicator tubes. EverLube Corp.

Circle 42 on postcard for more data

PRODUCTION EQUIPMENT



Besly No. 240, 30-in. double horizontal disk grinder

Pushbutton Grinder for Rings and Plates

S AID to be of a completely different design, a double horizontal disk grinder is applicable for high-speed precision finishing of piston rings, bearing rings, automatic transmission plates and similar shapes. It can reportedly hold parallelism within 0.0001-in.

All spindle motors are contained

within the broad, easily-accessible base. Pushbutton controls are on both sides; head and disk alignment can be read at-a-glance. Other features of the machine include sealed spindle quill construction, automatic pushbutton dressing, automatic sizing to adjust for disk wear, and edge-grain Formica wearing ways. Also head

assembly Neoprene-sealed against dust and coolant, fast magnetic rotary through-feed, and easy disk removal. According to its maker, the improved design of the unit reduces maintenance, dressing, change and setup down-time as much as one-third. The Besly-Welles Corp.

Circle 44 on posteard for more data

Ground Support Unit

FEATURING light-weight and compact design, a small-size air compressor with complete pneumatic system has been especially designed for ground charging struts and accumulators in aircraft. The compressor, Model 130R1409, is powered with a four-cycle, 2.85-hp Continental gasoline engine which drives the compressor at 3600 to 3800 rpm, providing a capacity of two cfm of free air at 3000 psi. Weight complete is 130-lb.

The system includes an oil and moisture separator with back-pressure valve providing compressed air with a dew point corresponding to -25 F. It also includes a storage



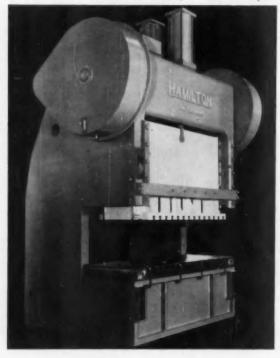
Cornelius air compressor assembly

tank for 25 cu ft of free air at 3000 psi, as well as a relief valve, check valve, and delivery valve. A unique feature of the system is said to be the manually-operated pressure regulator which, by means of a single control and automatic integral relief feature, provides any delivery pressure required from 0 to 3000 psi.

Maneuvering of the unit on aircraft aprons or ready-lines is easy for one man. Its capacity is considered by the company to be ample for all combat and commercial type airplane applications not requiring compressed air for use with air fuel starter systems. The Cornelius Co.

Circle 45 on postcard for more data

New Line of Gap Presses Announced



drawing, forming and blanking duty in the automotive industry, a new line of gap presses range in capacity from 100 to 300 tons, both single and double crank types. Large bed areas reportedly accommodate the increasing size of blanks formed into grille and bumper guards. Incorporated are pneumatically-op-erated flywheel brake, pneumatic clutch with electric control, and pneumatic counterbalance. Motorized slide adjustment is through barrel type screws which remain vertical at all stroke positions. Illustrated is the 250ton unit, which has a bed area 90 by 36-in. (Hamilton Div., Baldwin - Lima - Hamilton Corp.)

Developed for shallow

Circle 43 on postcard for more data

Dual Tank Attachment

Permitting both coarse and fine lapping on the Model 24 Lapmaster, a dual agitator tank attachment just introduced utilizes coarse abrasive in one tank and fine abrasive in the other.

In cases where lapping tolerances are not critical it is unnecessary to change laps and conditioning rings when switching from one tank to the other. Cleaning of the lap plate is all that is required. Thus, roughing to finishing and back to roughing, etc., can be maintained as one continuous operation. Not only does this effect higher production and considerable time savings, but it also substantially reduces equipment investment. One Model 24 Lapmaster with a single set of conditioning rings and one lap plate furnish a complete installation.

Where fine lapping is required, such as on surfaces of seats for mechanical seals, a second lap and set of conditioning rings is required. These are changed as the lapping operation is switched from coarse to fine and vice versa. Crane Packing Co.

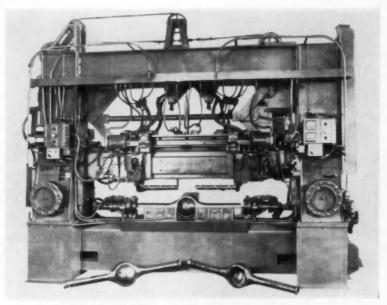
Circle 46 on postcard for more data

Radius Cutting Machine



The Model 11 Radii is a specialized milling machine designed to mill the ends at square, rectangular, round or flat ferrous and non-ferrous metals, in sizes up to 11/4-in. thick by 21/2-in. wide, in a matter of seconds. All the operator does is insert workpiece into vise of machine, set gage to radius to be cut, adjust slide, clamp work, and start cutter. Chips are drawn through a hollow spindle housing by means of a blower, and are ejected through a chute into chip pan at rear of machine base. (Special Machinery Co., Inc.)

Circle 47 on postcard for more data



Switt-Ohio automatic submerged arc welder processes rear axle housings

Automatic Submerged Arc Welding Machine

Featuring simultaneous welding an automatic submerged are welder has been designed and built primarily for welding transverse seams in rear axle housings. Its techniques and tooling, however, are also adaptable to a variety of high-production submerged are welding applications, according to the announcement of its availability.

In use, two stampings are simultaneously clamped in the machine. An upper platen securely clamps the housing halves during the welding operation. It is suspended from the crown by toggle linkage, and moves through side-mounted guides. Upon completion of the welds, an automatic ejector loosens the completed housing from the fixture, permitting its ready removal.

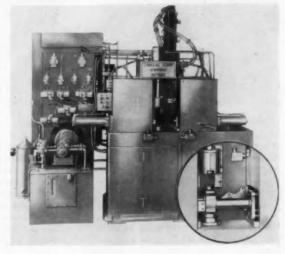
Provision is made for excess flux recovery, which returns the unused flux by screw and bucket conveyors to flux bins on the machine crown. Swift-Ohio Corp.

Circle 48 on postcard for more data

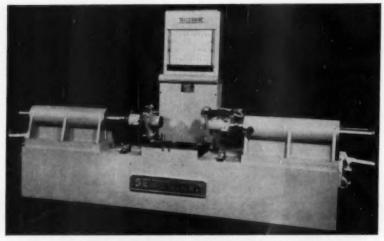
Assembly Machine Performs Five Operations

This automatic assembly machine is said to handle the following steering gear housing operations in a 10sec cycle: (1) Hopper feed and press in place one welch plug; (2) hopper feed and press in place two bushings; (3) press in place one ball race; (4) burnish ID of two bushings; and (5) inspect ID of two bushings. The inset at lower right-hand corner shows the parts in place for the operations. (Cadillac Stamp Co.)

Circle 49 on postcard for more data



PRODUCTION EQUIPMENT



Depth, Diameter and Flatness Gage

The 12-column Precisionaire pneumatic gage inspects three depths, four diameters, and five points of flatness of a transmission housing. In operation, the part is slid onto the servated surface and positioned by spring-urged tapered locators, air-retracted. Then the spindles are progressed into position for gaging diameters and depths. Five gaging cartridges mounted in the servated surface plate are used to gage flatness. (The Sheffield Corp.)

Circle 50 on postcard for more data

Pressure-Reducing Valves

Two low-pressure type pressure-reducing valves, now available, feature an unusually broad pressure adjustment range, being reportedly capable of supplying a controlled reduced outlet pressure from 25 to 1000 psi. They are primarily intended for



Vickers Model XTL-03-B pressure-reducing valve for oil-hydraulic systems

applications in industrial oil-hydraulic systems to provide, for secondary circuits, a controlled maximum operating pressure.

Both new valves are for use with %-in. nominal pipe size, in systems having operating pressures up to 2000 psi. Model XGL-03-B is a gasket-

mounted design; Model XTL-03-B is provided with %-in. pipe thread connections. Operation of these valves is said to be such that reduced outlet pressure is maintained essentially constant, regardless of inlet pressure variations above the selected setting.

Both models are nominally rated at eight gpm flow capacity. Free reverse flow is allowable, provided pressure at the reduced pressure port does not exceed the reduced pressure setting of the valve. Bleed control flow is approximately 35 cim. Vickers Inc.

Circle 51 on postcard for more data

Tapered Drill Sleeve

Made of Du Pont nylon, a drill sleeve now being marketed is said to eliminate most drill breakage. It is stated that when the drill hits a hard spot or air hole and stops, the sleeve, not the drill, will break.

While savings on drill breakage is the prime reason for installing the "Drill Saver," other benefits cited are low cost and the fact that it will not score spindles or bind. The material is reported to be cured to give it hardness to withstand difficult drilling conditions; and is not affected by coolants, oil or grease. Absorption of shock and vibration are also featured. The sleeves are produced in sizes 1-2, 2-3, and 3-4. James Products Co.

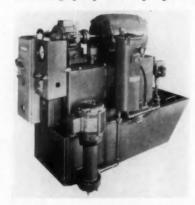
Circle 52 on postcard for more data

Coolant Supply Unit

For application when adapting standard vertical and horizontal drilling equipment to high-speed precision and deep-hole drilling, a highpressure coolant unit is said to provide for the first time completely automatic cooling, filtering and pumping of micro-clean coolant at pressures to 1000 psi and volumes to 40 gpm, with a total reservoir capacity, including settling and clean-oil tanks, of 85 gal. It is intended primarily for operations where gun or oil-hole drills operate at high speeds with a requirement for clean, high-pressure coolant to be fed through the drill shank. Coolant pressure is automatically maintained, regardless of flow. Because of the pump's design, there are no by-pass power losses. A castered dolly, furnished as an accessory, makes the unit mobile.

Micro-clean coolant is obtained with three-step filtering: a screen filter, gravity settling tank and special filter unit removing chips and particles larger than five-eight micro inches. A water-cooled heat exchanger, with controlled water flow, allows the maintenance of coolant temperature at the desired point.

A hi-low level control automatically maintains the clean-oil reservoir at the proper level; when the oil level falls too low, this control actuates the circulating pump which pumps oil



Sealol high-pressure coolant supply unit

from the settling tank through the final filter unit, heat exchanger and then into the reservoir. If, for any reason, no oil should be in the settling tank, a low-level cut-off breaks all circuits.

Shipping weight of the coolant supply unit is 1250 lb less motor, and it measures 69-in. long, 32-in. wide and 50-in. high. Sealol Corp.

Circle 53 on postcard for more data

Commutator Machine

The introduction of a fully automatic commutator turning machine, Model CTM 2000, has been announced. It is stated the new design of this machine, employing diamond cutting tools, allows a semi-skilled operator to turn automatically from 500 to 700 finished commutators per hour. Rough and finish turning can



Motor-Mation automatic turning machine for electric motor commutators

be performed simultaneously by using two diamond tools.

Flexible in application, the machine can reportedly be quickly adjusted to turn commutators of up to two inches in diameter and two inches in length, with a tolerance of 0.0003-in. and a 15 microinch surface finish if so desired. A complete armature change can be made in about 15 min.

The machine is actuated by two electric starting buttons, after which it cycles automatically. An emergency stop button returns all work stations to starting position. Two lubricating systems automatically supply oil to all vital working parts, including the armature shaft journals, during the copper-removing process. Motor-Mation, Inc.

Circle 54 on postcard for more data

Aluminum Etchant

BETTER-LOOKING, more evenly etched aluminum surfaces and reduced costs result from the use of a newly developed aluminum etchant, according to a recent announcement. The 85S aluminum cleaner was developed for use as a caustic etchant bath, and is said to be an effective means of cleaning and brightening aluminum surfaces. It contains an inhibitor for eliminating the formation of scale on tank walls and coils. It also reportedly supplies a built-in means of

minimizing the formation of sodium aluminate, an etching inhibitor at high concentrations, providing maximum utilization of the caustic soda.

The company furnishes process instructions for the use of the material. For example, the bath is initially made up with 8 oz/gal of 85S etchant. As the sodium aluminate builds up, the etchant concentration is increased to exceed the sodium aluminate content by 3 oz/gal. By maintaining this excess etchant content, it is said the bath can be operated for long periods without dumping, since hydrous aluminum oxide will settle out in the form of sludge. Dumping is necessary only when the sludge becomes excessive, in which case it can be flushed through sewage facilities or recovered, if desired. Hanson-Van Winkle-Munning Co.

Circle 55 on postcard for more data

Welding Controls

Two synchronous timers and two thyratron contactors, recently announced, are said to be designed to assure precise control of current duration and magnitude for uniform resistance welds.

The synchronous timers are offered in two models. The Model 2-152 single timer has two independent control



Raytheon Model 2-153 dual weld timer and Model 2-154 thyratron contactor

knobs, one for heat adjustment and one for time. The Model 2-153 dual timer has two independent controls for heat and two for time, permitting the use of two separate welding heads or a dual head. A transfer circuit for either foot or knee switch connection is provided on the dual timer. Both

timers control weld time from 1 to 10 cycles in increments of one cycle (60 cycle base), and the heat or magnitude of welding current is variable from 20 to 100 per cent of full current.

Either time ty be coupled with the Model 2-1 kva) or the Model 2-155 (5 kva yratron contactor. These electronic contactors reportedly provide accurate control of current duration and magnitude.

The contactors and synchronous timers are in matching cabinets and may be coupled together by means of integral plug-in connectors. Mounted together the timer and contactor use a common base plate and head piece to take up about one square foot of bench space. Raytheon Manufacturing Co.

Circle 56 on postcard for more data

Press Safety Device

N ow being offered is a safety device designed to prevent a press from "repeating" due to failure in any of the press mechanism, where the slide continues to stroke even though the run buttons have not been depressed. Called the Saf-Strok control, it is used in addition to normal operating controls.

The key unit in this safety circuit is a limit switch which is activated if the press crankshaft accidently goes beyond its normal stopping point. This switch is usually set so that 5 to 10-deg of crankshaft overtravel will actuate the switch and stop the press. Stopping the press when the switch is actuated is accomplished as follows: Two threeway solenoid valves are installed in the air line, one near the clutch and the other near the brake. Both valves are normally open so that when the press is operating safely they have no effect. However, should the crankshaft over-travel to the point where the limit switch is set, both valve coils will be energized simultaneously. The valves then will close and exhaust the clutch and brake of air. When this occurs the clutch disengages and the brake engages, stopping the slide.

Once the valves have been energized, a red indicating light goes on and the press cannot be operated until a button is pressed to open the valves. A test button is also provided which when depressed by-passes the press limit switch and simulates a failure, thus making possible a daily check of the safety control. Clearing Machine Corp.

Circle 57 on postcard for more data



So effective is the AiResearch turbocharger that it provides power gains while actually lowering the heat level of the engine.

Ambient air is compressed with an efficiency as high as 82%, feeding a maximum weight of air into the cylinders at the lowest possible temperature.

Results: maximum power gain at minimum fuel cost; complete combustion with elimination of objectionable smoking; low engine thermal loading insuring long, trouble-free operation.

All AiResearch turbochargers are air cooled, placing no added burden on the diesel cooling system and requiring no complicated plumbing. The rotating assembly

is removable as a unit, simplifying in-the-field maintenance. This advanced design evolved from the most extensive experience in the field of small turbomachinery in America.

Your inquiries are invited.

BASIC SPECIFICATIONS FOR AIRESEARCH TURBOCHARGERS

MODEL	T-10	T-14	T-15	T-30-2	T-30-6
Diameter - in. nom.	9	11.5	15.25	15.25	16
Length - in.	9	14.12	16.75	17.25	21.75
Weight - Ib.	40	95	125	135	195
Output - Ib/min.	25-40	35-65	35-65	70-95	115-175
(Standard Conditions)					



AiResearch Industrial Division

DESIGNERS AND MANUFACTURERS OF TURBOCHARGERS AND SPECIALIZED INDUSTRIAL PRODUCTS

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Plastics

To help designers choose the righttype plastic for a given use, a condensed reference file lists the characteristics of six groups of plastics and their major fields of application, in 16-page booklet J-710. Bakelite Co.

Cleaning Abrasives

The characteristics, application and selection of a series of blast cleaning abrasives are covered in 12-page Bulletin 333, issued by Pangborn

Spring Calculator

A handy calculator of the circular slide rule type is being offered, which is said to make it easy to determine the weight of springs made from given sizes of round wire or flat stock. National-Standard Co.

Combustion Safeguards 5

Bulletin SC-1006, 12 pages, describes the operation and construction of safety devices which detect, localize and extinguish flashbacks occurring where a mixture of fuel gas and air is distributed to processing equipment. Selas Corp. of America.

Casting Alloys

A wall chart 17 by 22 in. gives in tabular form the chemical compositions and the Navy, SAE, ASTM and Federal specification designations of 37 standard brass, bronze and nickel silver casting alloys. Henning Bros. & Smith.

Flexible Couplings

Torsionally-flexible couplings, employing preloaded rubber biscuits as the flexible medium, are described in 24-page Catalog C41-56, which includes selection data. Morse Chain

Electric Motors

Twelve-page booklet B-2103-1 contains information on how to select a-c motors for specific applications. Reliance Electric and Engineering Co.

Hoists and Lifts

A line of hand hoists, lifts, and plain and geared hand hoist trolleys is listed in a 44-page booklet published by The Yale & Towne Manufacturing Co.

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FREE LITERATURE—Continued.

The 28-page second edition of booklet "Stainless Castings" gives data on corrosion and heat resisting castings, as well as the physical and chemical characteristics of stainless steels used in casting. Allegheny Ludlum Steel

Lubrication Systems

Automatic and semi-automatic centralized lubrication systems for a wide range of small machines are described in 24-page bulletin 4C. Bijur Lubrication Corp.

Positioning Controls

Electric remote positioning controls for both pushbutton and automatic operation are covered in eight-page Bulletin J-100, which features a new shaft mounted control gearmotor for valves and variable speed drives to provide remote or automatic flow. speed, proportion and tension control. The Jordan Co., Inc.

Silicones

Almost 150 commercially-available silicone products are described in 12page reference guide 1-112, each being grouped by usage to enable material selection by what it does as well as by what it is. Dow Corning Corp.

Gear Shaving Cutters

Twelve-page reference manual CR 56-10 deals with the care and use of gear shaving cutters, and includes cutter specification tables and data on speeds, feeds, sharpening, and application. National Broach & Machina Co.

USE THIS POSTCARD

Industrial Brushes

Catalog 210-C, 100 pages, discusses how to select and use power brushes, brushing machines, wire brushes, paint and varnish brushes. Address request on company letterhead to The Osborn Manufacturing Co., 5401 Hamilton Ave., Cleveland 14, Ohio.

An 11-page technical bulletin gives engineering data on high strength epoxy resin adhesives for metal to metal bonding and honeycomb sandwich construction. Adhesives and Coatings Div., Minnesota Mining and Manufacturing Co.

Heat Treat Lines

17

Mechanized heat treating is explained in Bulletin SC-176, eight pages, which illustrates 24 basic furnace mechanisms by means of isometric drawings. Surface Combustion Corp.

Spring Design

18

The fundamentals of spring design and material selection for wire compression springs, motor springs, spring washers and other types are briefly set forth in eight-page brochure available from Associated Spring Corp.

Plating Equipment

Three automatic machines for plating are shown in Bulletin 856, eight pages, published by The Meaker Co.

Automatic Lathes

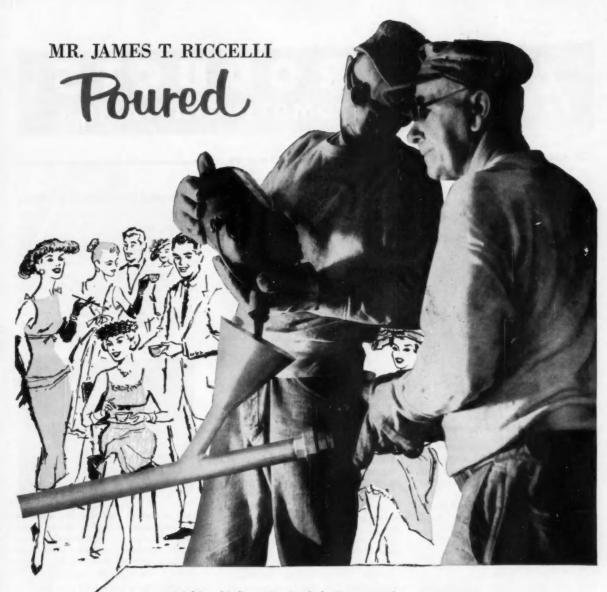
Bulletin 808, 24 pages, describes the Model 21 Mona-Matic automatic cycle lathe, including its multi-cycle programmer control system and an optional automation system for mechanized workpiece handling. Address request on company letterhead to The Monarch Machine Tool Co., Sidney,

Die Sets

Catalog 11, 76 pages, has a technical and price sections on die sets and accessories. Address request on company letterhead to The Producto Machine Co., 990 Housatonic Ave., Bridgeport 1, Conn.

V-Belt Drives

Engineering data on industrial Vbelt drives, intended for the user as well as the designer, is available in 66-page manual. Address request on company letterhead to Maurey Manufacturing Corp., Publications Div., 2915 South Wabash Ave., Chicago 16. Ill.



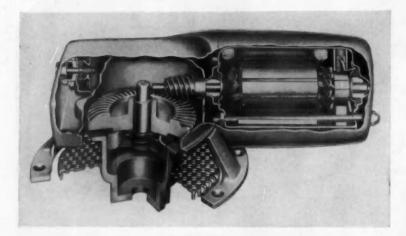
Making high quality leaded alloy steels is no tea party. The planning, the constant scientific study, the checking of minute details by skilled metallurgists and workmen that goes into the creation of one billet of leaded steel represent one of the highest forms of industrial craftsmanship. That is why Copperweld, manufacturer of the most diversified lines of lead-treated alloy and carbon steels, is recognized leader in the manufacture of hot-rolled blooms, bars and billets.



COPPERWELD STEEL COMPANY • Steel Division • Warren, Ohio EXPORT: Copperweld Steel International Co., 225 Broadway, New York 7, N. Y.

HEW PRODUCTS

FOR ADDITIONAL INFORMATION, please use reply card on PAGE 89



Electric Starter System for Small Engines

Development of a pushbutton-operated electric starter for small two and four-stroke gasoline engines, and arranged for either 12-v battery or 110-v a-c operation, has been announced. The unit is designed to operate with leading types of small gasoline engines now on the market. It also can be used to replace rewind starters on units in the field.

A feature of the battery-operated unit is that it includes a charging unit that gets its power from any 110-v a-c source. The battery is rated at 10 amp-hr and is said to provide enough power for 150 or more normal starts without recharging. Recharg-

ing is at a trickle rate of %-amp, with approximately an overnight charge being required to bring the battery to charged condition after a normal month's operation.

Another feature is the use of a direct gear drive. The gearing is of the "Spiroid" type, which is said to give compactness, efficiency, and dependability.

A space about 5 by 9 by 4-in. is required for mounting the starter. Total weight of the battery-operated unit is 22 lb; while weight of the a-c operated plug-in unit is 7 lb. Magneto Div., Fairbanks, Morse & Co.

Circle 60 on postcard for more data

Rubber Bonding

The availability of a new system for bonding rubber to metal that will reportedly reduce production costs, was recently announced. Called Duolock, it combines a primer with appropriate tie coats, and may be used on engine mounts, industrial tires, rubber-covered rolls or wherever rubber materials, either natural or synthetic, are bonded to metal. According to the company, extensive testing of the system has revealed that superior bonds may be obtained over a wide range of curing conditions, such

as long low-temperature cures or short high-temperature cures.

Duolock primer is a free-flowing, single phase, black liquid supplied at a viscosity of 95 centipoises with a solids content of 22 per cent, suitable for brushing.

The company also announced that its technical service will assist firms in selecting the best adhesive to combine with the primer for dependable results. Adhesives Div., B. F. Goodrich Industrial Products Co.

Circle 61 on postcard for more data

Thread Cutting Fastener

Designed primarily for holding diecut or cold-forged nameplates, emblems and trim against sheet metal surfaces, the TCF fastener cuts threads on unthreaded studs, including chrome-plated, and may also be used in other applications which require a spring take-up fastener. When used with its pre-assembled plastic sealer, a water-tight seal is obtained. The announcement states it is low in



cost, re-usable, self-locking, and vibration-proof, and has a spring take-up which insures flush-mounting on flat or contoured surfaces. Sizes are available to fit \(\frac{1}{2} \)-in. and 3/16-in. studs. United-Carr Fastener Corp.

Circle 62 on posteard for more data

Temperature Indicator

Gaging engine temperatures up to 500 or 600 F, a new temperature indicator, developed for a 200-mph business plane, is said to combine a high degree of accuracy with low price. Resembling a spark plug with an extended copper cylinder, the unit is mounted in the engine cylinder head. This sending unit has a built-in, negative-coefficient resistor whose resistance is lowered as the engine temperature rises. The "reading" is transmitted by wire to the gage on the instrument panel, changes in resistance causing the pointer to move. AC Spark Plug Div., General Motors Corp.

Circle 63 on postcard for more data

Smaller, Lighter Motors

Capacitor-start and split-phase fractional horsepower motors, in rigid and resilient base models, have been made available in NEMA 48 frame size by a company. Through the use of smaller, light-weight, precision-



machined steel frames and cast aluminum endplates, the weights of 1/6, ¼ and ½-hp ratings have been reduced from three to eight pounds.

A new lubrication system permits mounting sleeve bearing motors at any angle with protective lubrication in every position. The bearings, lined with high tin babbitt, have antiseizure and non-scoring characteristics, and high corrosion resistance, and provide smooth performance. High dielectric strength, moisture resistance and thermal stability resulting in longer motor life, have been obtained through the use of Mylarpaper laminated slot insulation. A dependable quick-break switch and an accessible terminal board are other stated features of the new designs. Wagner Electric Corp.

Circle 64 on postcard for more data

Metal Laminates

Now available in a wide range are metal laminates that are combinations of two or three metals metallurgically bonded together to form one "sandwich." The combined metals are said to offer physical, chemical and other properties unobtainable in a single metal. Metals such as stainless and mild steels, Monel, copper, brass, titanium and some precious metals can be bonded together to form laminates of varying thicknesses.

In addition to their high bonded shear strength, the laminates are said to be easily formed and joined, to resist corrosion, and to be capable of serving two or more functions. Illustrative is an application in heat exchangers where both heat transfer and resistance to corrosion are of importance. It is also noted that by laminating a thin sheet of expensive metal to a thick sheet of lower-cost metal, the overall cost of the laminate is often less than the cost of a single, thick sheet of the expensive metal. The specific properties of a laminate naturally depend on the metals used. In general, the strength of the laminate is the average of the strength of the component metals, and the thermal conductivity is the intermediate of the component metals. Bridgeport Brass Co.

Circle 65 on postcard for more data

Neoprene Compound

Announced is a self-curing Neoprene compound that can be flowed onto bolted or riveted flanges and lapped metal sheets to seal against air, dirt, water, oil, and corrosive fumes. It gradually cures into a tough, elastic gasket, providing a permanent weatherproof seal. The material is said to be especially suited for air, fume and heating ducts; cargo trailers and buses; and for marine and aircraft construction. The N-99 sealing compound is available in cardboard cartridges for application by hand or special air-operated guns. Gates Engineering Co.

Circle 66 on posteard for more data

Accurate ID Tubing

Now being carried in warehouse stock is comparatively low-cost, cold drawn, seamless steel mechanical tubing, for the production of honed cylinders, that can be specified to conform to standard tolerances for ID, as well as OD. Sizes available range from two through nine-inch outside diameter. Joseph T. Ryerson & Son,

Circle 67 on posteard for more data

Reproduction System for Drawings

Introduction was recently made of a reproduction system on film which is said to produce sharp, clear and distortion-free "second" originals up to 36 by 54 in. in size, and longer, and to be capable of improving most worn and smudged drawings. The system, called Micro-Master and based upon the use of a 105-mm negative, is being offered as a nation-wide service. It is stated that equipment is now being installed in key industrial centers throughout the United States and Canada, and that within a few months the service will be available in 40 major cities.

The 105-mm negative size of Micro-Master is reported to be the smallest area possible for handling and storage, consistent with the ability to achieve full-scale reproductions without loss of detail. Yet the negatives are small enough to fit into standard five by eight filing drawers, and a series of them is said to occupy only about 1/25th the space required for an equal number of tracings.

Economical four by six inch card prints are available for filing and reference. The line of equipment includes screen projectors, table-top viewers with an 8 by 12-in. surface (illustrated), and large-size viewing tables for drafting room use. The system was developed by Micro-Master, Inc. in association with Keuffel & Esser Co.

Circle 68 on postcard for more data





(Continued from page 37)

Mercury Div. general offices are now located at 3000 Schaefer Road, Dearborn, Mich.

Crucible Steel Co. of America has appropriated \$25 million for new plant facilities.

Link-Belt Co. has acquired Detroit Power Screwdriver Co. . . . Pennsylvania Salf Mfg. Co. is acquiring Delco Chemicals, Inc.

Air Materiel Command has developed a controlled precision die forging method for producing propeller hubs.

Lindberg Engineering Co. has opened new sales offices at Rochester, N. Y.

DuPont Co. (United Kingdom). Ltd., plans to build a neoprene synthetic rubber plant in Northern Ireland.

Martin Co. has formed a subsidiary known as Martin International to explore and develop world markets for nuclear powered electrical generating systems. . . . Brown Fintube Co. has formed a subsidiary company known as The Brown Thermal Development Co.

U. S. Steel Corp. plans to add over 1.3 million ingot tons to the steelmaking capacity of its Chicago District plants.

. . .

Chevrolet Motors
Div., General Motors
Corp. — K. E. Staley
was appointed executive assistant sales
manager.



MEN in the NEWS

(Continued from page 40)

Illinois Gear & Machine Co.—T. S. Pacer, E. B. Smiley, and G. P. Sullivan have been elected vice-presidents.

Central Foundry Div., General Motors Corp.—Elmer E. Braun has been promoted to divisional works manager; Leslie L. Shafer, sales manager; and Gordon S. White, plant manager.

Brooks & Perkins, Inc.—Edward H. Perkins, Jr., was elected vice-president.

Clark Equipment Co., Industrial Truck Div.—Glenn A. Christians has been made acting advertising manager.

American Steel & Wire Div., U. S. Steel Corp.—Harry L. Jenter has been named vice-president of operations.

Studebaker de Mexico, S. A.—Clark R. Fletcher, Jr., has been appointed president.

Detroit Transmission Div., General Motors Corp.—F. James McDonald was named works manager.

Dayton Rubber Co.—Bernie F. Thomas has been made director of public relations.

Bendix-Westinghouse Automotive Air Brake Co.—Frank A. Haag was named manager of automotive refrigeration.

Industry News

(Continued from page 39)

Penn Keystone Corp. Purchases A Division of H. K. Porter Co.

Penn Keystone Corp., of West Conshohocken, Pa., has announced the purchase of the Keystone Div. of The Riverside Metal Company Div. H. K. Porter Co., Inc. Production and other facilities of the Keystone Div., which manufactures position indicators for aircraft and industry, have been transferred from Riverside, N. J., to the Penn Keystone plant at West Conshohocken.

The Penn Keystone company was organized early in 1956 for the development and manufacture of aircraft instruments and electro-mechanical mechanisms. Penn Keystone officerare: President, George Peterson, Jr.; Vice-President, Paul H. Hershey, president of Hershey Metal Products, Inc., Derby, Conn.; Secretary, John A. Frey, secretary, Hershey Metal Products, Inc.; Treasurer, Raymond W. Gardner, Charles H. Gardner Co., Philadelphia, Pa. Mr. Peterson was associated for many years with the Keystone Div., Riverside Metal Co.

American Brake Shoe Enters Aluminum Castings Business

American Brake Shoe Co. is entering the specialty aluminum castings business. Limited production in a pilot foundry has been under way for about one year, and a new aluminum foundry is under construction at Mahwah, N. J.

The castings are the outcome of a research program initiated in 1954 and are now being used by aircraft manufacturers in structural parts and control assemblies. They will soon be available for general industrial applications.

REPORT FOR FIRST THREE QUARTERS SHOWS MARKED DECLINE OVER 1955 Regional Sales of New Passenger Cars

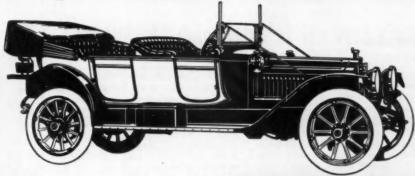
					841	Manda	Per Cent Change		
		Seatember	August	September	Nine Months		Sept, over	Sept. over	Nine Months
Zone	Region	1956	1956	1955	1956	1955	August	Sept. 1955	1956 over 1955
2 2	New England	77,936	30,287 107,572 72,596	36,781 120,159 81,133	263,267 879,418 601,861	307,132 1,041,074 676,103	-24.70 -27.55 -23.36	-37.90 -35.14 -31.41	-14.28 -16.53 -10.98
4 5	East North Control East South Centrol	98,535 19,238	131,237 27,619	156,876 30,658	1,125,000 226,576	1,385,132 270,807	-24.92 -30.35	-37.19 -37.25	-18.78 -16.33
7	West North Central West South Central Mountain	42,489 16,060	52,428 56,043 18,374	68,934 22,221	400,603 423,282 153,692	477,096 502,323 175,730	-27.11 -22.81 -12.65	-38.36 -27.77	-15.74 -12.54
	Pacific		73,164	78,863	539,057	633,731	-31.52	-36.47	-14.94
	Total-United States	421.021	568,320	654,532	4,612,825	5,469,128	-25.92	-35.68	-15.68

States comprising the various regions are: Zone 1—Conn., Me., Mass., N. H., R. I., Vt. Zone 6—Iowa, Kan., Minn., Mo., Neb., N. D., S. D. Zone 7—Ark., La., Okla., Tex. Zone 2—N. J., N. Y., Pa. Zone 3—Del., D. of C., Fla., Ga., Md., N. C., S. C., Zone 8—Aris., Colo., Ida., Mont., Nev., N. M., Utah, Wyo. Zone 9—Cal., Ore., Wash. Va., W. Va., W. Va.

WHEN COMPRESSION RATIOS WERE 3 to 1...

any good oil ring would do!

1912 Packard with left drive control, electric self-starter, electric lighting. Starting, ignition and carburetor controls on steering column. Rated horsepower-38. Maximum brake horsepower-60. Engine-6 cylinders with bore of 4", stroke of 51/2". A great car in its day!



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PERFECT CIRCLE **TYPE "98"** CHROME OIL RING

to meet the exacting demands of modern high-compression engines

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Best for new engines . . . essential for worn engines

Preferred by more people than any other brand!

The Perfect Circle Corporation, Hagerstown, Indiana
The Perfect Circle Co., Ltd., Don Mills, Ontario



Observations

By Joseph Geschelin

Automation Problems

Production people must take into account the increasing complexity of automation in planning new programs. That became evident this season judging from personal accounts given the writer. Many, if not most, of the 1957 production programs were delayed not because of lead time but because of the job involved in installing, tooling, and making the equipment work. Machine tool builders have cooperated nobly in giving service and we are sure that no seasoned production man blames the supplies. It is simply that automatic equipment, regardless of size, is so complex that it requires more time to tune than previous experience has indicated.

Closed

One of the most valuable management tools to come of age is closed circuit TV in black and white or color. Admittedly, it is not as good from a psychological standpoint as is the personalized presentation before groups in various parts of the country. From an economic standpoint, however, it has great merit. Consider for example the presentation of a new line of vehicles. This has been done in one of two ways: either a single huge meeting to which dealers and sales representatives are invited; or by a packaged show in a large number of major cities around the country. The latter, which is most practical, requires an enormous amount of planning. not once but in each city. It forces important executives to travel for long periods of time at a time when they should be at their desks. Closed circuit TV is a live studio program which is communicated simultaneously to any number of meeting groups over the country. Moreover, each meeting is personalized by having either the local sales or zone people or someone from the factory acting as an MC. The presentation can be all-inclusive, including a special canned film, as was done by Willys recently.

Air Ride

Cadillac has pioneered air ride with the introduction of the Brougham. Not only a soft ride but a level floor is promised. Doubtless this will encourage other manufacturers to take a serious look at this latest development in suspension systems.

Solid Fuel Injection

Fuel injection for passenger cars has been launched by three vehicle producers at this writing. The price tag, ranging up to \$500, will surely limit the number of customers at the start. But unless shortcomings become evident, the trickle may become a production reality and with production lower prices. Serious consideration doubtless is being given to the application of fuel injection on motor trucks. For this is a place where even moderate gains in fuel economy together with gains in horsepower and torque not only will pay off but would mark an important step forward. We realize that the diversity and low volume associated with heavy duty vehicle production may not be attractive at the start. But it should be feasible to equip at least those truck engines that are borrowed basically from passenger car V-8's.

Integral Frame

Considerable attention has been given of late to the integral bodyframe construction typified by the current AMC cars and the earlier Lincoln Zephyr. If we separate promotion from practicality there remains only one good reason why it is not feasible to convert from present designs in existing cars. The simple fact is that conversion to a frameless car would affect all body building tooling and plant layouts, would require a complete change in existing assembly lines, and, what is equally serious, a complete

change in tooling and layout if existing assembly plants dispersed at various localities. The change would be simple and practical only when planning for an entirely new car such as, for example, the Edsel. The fact that GM cars built overseas are of frameless type bears on this point.

Low

1957 has brought in cars lower than ever contemplated. In fact, they demonstrate that the roof line must remain at a certain level for good between the limits of adequate ground clearance and the structure of the human body which has taken some millions of years to evolve. The fact that sports car enthusiasts and racing drivers apparently love to drive while sitting practically at floor level does not mean that the millions of car owners, including many millions of women, can be comfortable in this position. We seem to be faced with the fact that seat height and normal positioning of legs and feet dictate just how much lowness car owners can tolerate with comfort for long trips.

Power Package

We hear that consideration is being given to the adaptation of the alternator type electrical system as an answer to the need for a central power source for operating all special accessories as well as the increasing electrical load. This idea could be brought to fruition much more quickly if it were feasible to design a new type of alternator-simpler, lighter, more compact, and less expensive. If this can be done, it will still be necessary to develop some advanced form of rectifier employing materials that are in plentiful supply. This is a necessity since standard equipment requirements alone will have to be based upon yearly production rates of over 10-million vehicles by 1965.

DU PONT ELASTOMERS





New opportunities in design— Colored HYPALON® is highly resistant to ozone and weather

HYPALON, Du Pont's new synthetic rubber, can be compounded in white or in an unlimited range of brilliant colors that remain stable under exposure to light. This offers style-conscious designers the services of a rugged elastomer, capable of blending beautifully with any of the various automotive paint colors.

Of practical importance to the rubber stylist is the fact that the entire rubber part need not be HYPALON. Ordinary rubber can be dressed up in a colorful HYPALON coating—applied either as a liquid or as a mechanical skin. Such coatings, or veneers, bond well to most other elastomers, and they are as free to flex and stretch as the rubber part to which they are applied.

Hypalon's resistance to weathering and ultraviolet light has been demonstrated in long-time exposure tests in Florida and Delaware. Brightly colored specimens, in a variety of shades and hues, were exposed to the elements for thirty months with negligible effect on properties or appearance.

In addition to resistance to sunlight and weather, HYPALON has unusual resistance to ozone, In fact, no HYPALON product has ever been reported to develop an ozone crack, not even the HYPALON gaskets used to seal laboratory and commercial ozone generators in which the ozone concentration may reach six per

Investigate the possibilities for using HYPALON in automotive design by mailing the coupon at the right,

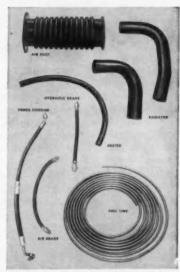
NEOPRENE demonstrates its versatility, long service life in hose and tubing

Resistance to oil, ozone, heat and weather—key advantages

There's a lot of hose on a car, and it's subject to all manner of abuse. Heat, hot oil and ozone combine to attack any rubber material under the hood, and weathering is an everpresent problem. It takes an unusual—and versatile—rubber to take this kind of punishment. That's why neoprene is used by so many car manufacturers for hose and tubing.

In the photograph at the right you will find some of the many hose and tubing applications for neoprene. On radiator and heater hose the neoprene cover resists the attack of heat and ozone and the neoprene tube resists the soluble-oil rust inhibitors used in anti-freeze. Hydraulic brake hose is protected by neoprene from heat, ozone and weather. Power steering hose—with cover and tube of neoprene—gives extra-long service despite exposure to heat and ozone on the outside, and to hot oil on the inside.

The list of hose and tubing applications for neoprene continues to grow, but neoprene has many other uses in the automotive industry. It's being used as a diaphragm in powerbrake units because it can withstand



MANY VARIETIES of neoprene hose and tubing serve the automotive industry. All have this in common: extra-long service life.

heat and flexing. Resistance to ozone, oil and engine heat make neoprene the standard for jacketing on ignition wire. You'll also find neoprene used in seals and boots, flexible couplings, and as a saturant in paper gaskets.

How can you use neoprene's unique balanced combination of properties? Further property and application data are available. Just clip and mail coupon below.



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Steel Output Continues at Record High as Scrap Prices Reach
New Peaks. Copper Demand Shows No Immediate Improvement

By William F. Boericke

Steel Production Cannot Meet Demand

By mid-December steel production had mounted to the highest level in history at 2,511,000 tons of ingots and castings per week with operations at 102 per cent of capacity. Steel plate shipments of nearly 800,000 tons were the highest since 1944 during the War. Warehouses continued to be the major recipients of steel shipments. Automotive interests were still taking less steel than normally expected but demand is rapidly picking up as production gets into higher gear with the new models. A shortage of hot rolled sheets appears imminent and automobile manufacturers are being obliged to turn to the more costly cold rolled sheets which are still in more comfortable supply.

It is scarcely news to assert that plates and structural shapes are the products in tightest supply. They have occupied that position for months, and relief seems as far distant as ever. The shortage has become of critical concern to Washington because of steel needs for the scheduled oil tanker construction program. Fifty big tankers will require upwards of 750,000 tons of plates. Federal allocation may be required to assure a supply for the tankers, but this is vigorously opposed by steel executives who fear that if tanker builders get special treatment, it will open the door for other users to claim the same privileged buying. Nevertheless, it appears certain that any prolongation of the problems at Suez means increasing defense requirements with almost mandatory Government controls over shipments.

Costs Rise

Steel costs are rising. Many steel executives are not hesitant about calling for an early increase in the base price, but in the absence of any step in that direction by U. S. Steel, it has not materialized. Some companies are taking steps to bolster profits by increasing charges for "extras", that is the charges made by mills for special processing and handling to suit customers' specifications. Higher costs for coal. imminent increases in freight rates, and in particular the extraordinary rise in the price of steel scrap, have all whittled down profits. It's been estimated that since the \$8.50 per ton increase in the base price that followed the settlement of the steel strike in July, production costs have risen \$5 per ton.

Scrap At Peak

Steel scrap markets have spiralled as high as \$68 per ton in Chicago, an all-time record. Scrap now is more costly than pig-iron. Some mills have put in escalator clauses to offset higher scrap costs. The trade gloomily agrees that scrap prices are going to stay high. So-called "purchased" scrap is being consumed at a 40-million ton a year rate, up 5 million tons over 1955. Exports of scrap continue high to Japan and the Continent. Scrap collections are normally more difficult to make in the winter months and inventories are being depleted. Rising scrap prices, as noted, are putting additional pressure on finished steel prices, particularly on specialty steel manufacturers using electric furnaces.

Outlook for 1957

1957 shapes up as an excellent year for steel. Certainly the year opens with demand insistent in practically every division of the industry. Iron Age expects to see increases in every consuming line with the possible exception of housing but industrial construction is expected to compensate. A prosperous year is forecast for the machine tool industry. The farm implement manufacturers should snap back from their slow business in 1956 with a sales rise of 10 per cent. New records will be made for oil country goods. The railroads will ask for 10 per cent more steel with emphasis on rails. Shipbuilding will be up 20 per cent. Warehouse demand will be heavy, and the automobile industry will need millions of tons for an estimated output of 6.5 million cars.

Reaching for the trusty crystal ball, it is thought that the operating rate will be 99 per cent of capacity for the first quarter, 98 per cent for the second, 80 per cent for the third (usual seasonal decline) and 89 per cent for the fourth quarter. The dollar volume, because of virtual certainty of a price increase next July, may well exceed these ratios. An increase of \$5-6 per ton is expected following the wage increase to be granted then.

(Turn to page 102, please)



GREENLEE

special-purpose machines for <u>profitable</u> mass production



Master brake cylinder machined on above Greenlee Special Machine.

THEY SAVE WORK...THEY SAVE MONEY

If you are being outdistanced in today's swift race for production...faced with narrowing profit margins...it will pay to investigate Greenlee Special Machines. Savings effected on drilling, reaming, boring, counterboring and tapping operations will quickly amortize your invested dollars.

(Above) Greenlee Horizontal Indexing Machine designed for processing master brake cylinders has proved itself with raised quality and lowered costs.

(Left) Greenlee Two-Way Horizontal Indexing Machine equipped with Power Clamping and Automatic Unloading increased previous production rates and lowered costs.

Wheel cylinder machined on

Greenlee Special Machine

WRITE FOR COMPLETE INFORMATION



GREENLEE BROS. & CO.

1751 MASON AVENUE ROCKFORD, ILLINOIS

BRAINSTORMING - How it Works

(Continued from page 63)

Success of a group depends largely upon the leader. He must have the respect of the group, not necessarily because he is an expert on the particular problem, but because of his skill in guiding the sessions. Above all, he must guard against any tendencies of the group to bring judgment into play.

In addition to the group leader, every session should have a recorder. The recorder puts down all ideas, even ones which seem to overlap, on a board or chart in front of the group. He is also free to contribute his own ideas at any time.

The time allotted for each brainstorming session must be variable. The length of time that can be spent profitably will vary widely with the nature of the problem and the group itself. As a rule, 15 minutes is probably the minimum time and about one hour the maximum.

The usual procedure of a brainstorming session goes something like this:

- Warm up by the leader—jokes comments, stories, short exercises or problems to get group attention and interest.
- Preliminary statement of the problem—in terms most conducive to creative thought, but still specific enough to avoid wandering.
- Explanation of ground rules by the leader, such as the number of ideas expected from the group and amount of time allotted. He also warns members that criticism, ridicule, or evaluation of proposals is not acceptable during the session. Phrases such as "We've tried it before", "Impractical", "Well, maybe it would work", "Doubtful", "How crazy can you get", etc., will not be tolerated.
- The leader starts the group off with an idea—the wilder the better; and then stimulate the group when ideas begin to lag by contributing his own idea, elaborating on someone else's idea, making formal use of one of the checklists, or if everything else fails, calling a break. The leader is always prepared to: take action against any show of judgement or ridicule; bring group back to the problem should they begin to stray; prevent a few persons from monopolizing the session.

Practical Applications of Brainstorming

A wide variety of examples are cited by Alex Osborn in his book, Applied Imagination. One group de-

veloped 45 suggestions for a home appliance firm, another, 56 ideas for a fund raising drive, still another, 124 ideas on how to sell blankets. Fifteen separate groups tackled the same problem and produced over 800 ideas, 177 of which were turned into concrete proposals. On the problem of merchandizing colored telephone sets, a group came up with 82 ideas and 18 were put into actual use. One session produced 993 unduplicated names for a new combination washer and dryer.

At AC, brainstorming sessions in the tool engineering division have been very productive. One group brainstormed 40 separate uses for used cutting fluids, ranging from use in oiling roads to use as a liquid in ornamental lights. Another group came up with 26 uses for chips and lathe turnings. Some of these uses were: Christmas tree ornaments, furnace filters, reinforcing for concrete, scouring pads, and so on.

How to Get Started

The first thing to be considered when starting a program is the selection of a problem. The problem should be relatively simple in the sense that it is comparatively free from subproblems or is not highly interrelated with other problems. A problem such as "reducing costs in our company" is actually composed of a myriad of sub-problems, any one of which might be an appropriate topic for brainstorming. Take another example of an inappropriate problem for a single session: "Improved methods of packaging, storing, and shipping our products." This one actually includes three inter-related problems; such a selection would result in a quick dispersion of group attention.

Although the problem should be as specific as possible, this does not mean that the problem statement should be such that it limits possible solutions. For example: "Design a better coat hanger," immediately limits a group to variations on a standard coat hanger: "Devise a better method for storing clothes" opens up a wide range of possibilities of which a coat hanger is only one. We do not necessarily want "a better toaster," but rather a better way of "browning and dehydrating bread." The principle here is to state the problem in its most basic form and not in terms of a present solution, however adequate or inadequate.

We have already elaborated to some extent on the importance of good leadership in brainstorming sessions and on the ideal composition of brainstorming groups. The group should be as compatible as possible; that is, free from any inter-personal jealousies, rivalries, or friction. It is helpful to deliberately include a few known "idea men" and self starters. The leader should be armed, in advance, with a few ideas of his own which can be thrown in should the session begin to lag. An explanation of brainstorming and particular stressing of the rules in advance to the group will help ward off trouble. Brainstorming, like other activities, becomes easier and more effective with practice; so it is wise not to expect miracles, or lead the group itself to expect too much of initial sessions.

Follow-up on Ideas Gathered in Brainstorming Sessions

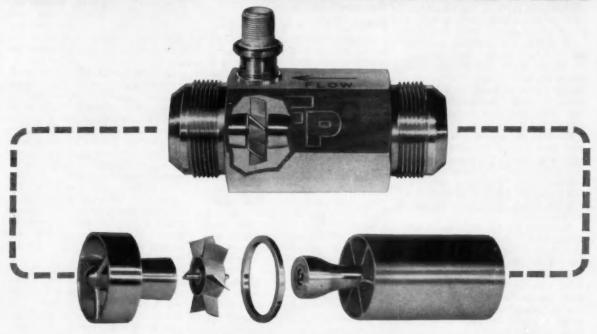
The recorder, soon after the brainstorming session, should revise the list of ideas. In some instances, he may be able to combine ideas which are very similar. Some ideas may need elaboration to make the intent clear; others very probably can be condensed. Frequently, ideas can be grouped under logical headings for ease of reading and further study. The aim of the recorder should not be to change or improve on or eliminate any of the ideas, but rather to put them in concise and orderly form for the consideration of others.

With regard to the evaluation of the ideas and putting the good ones into actual use, three alternatives are possible: The original group may be called back to evaluate the ideas and pick the most promising ones for further study; another group may be convened for this purpose; or the complete list of ideas may be broken down and channeled by the recorder to the appropriate persons for action.

There is some justification for calling the original group back for this purpose; since some pride of authorship is involved, the group will tend to examine the merits of each idea very closely before deciding to discard it. Ultimately, of course, the best ideas will have to be reviewed by someone in a position to decide on their trial or use, but the screening process can very easily be done by the original group.

The foregoing is an abstract of a paper presented by the author to the 20th Anniversary Clinic of the Industrial Management Society held in Chicago last month.

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METALS ...

(Continued from page 98)

Nickel Price Raised

The long-awaited increase in the nickel price was announced early in December by International Nickel Co. The world's largest nickel producer hiked the price 9½ cents a pound to 74 cents. The company declared the price increase was needed because of higher costs and to facilitate maximum production. This was the largest single advance in the metal's price recorded. The previous 64½ cent price had held for over two years.

However, for well over a year the grey market price for nickel, euphemistically called "premium" nickel, has ranged over \$2 a pound, and a leading trade publication has regularly quoted such markets in its columns. Nickel is still very much on the scarce list.

Best news for the nickel consumer. although the promised relief is still years away, was announcement by the big company that it would open two new nickel mines in the Mystery Lake area in Manitoba and invest \$175 million in the project. This project would raise the company nickel capacity by 1960 to 192,000 tons, or about 65,000 tons over present output. Of more immediate consequence to the consumer is deferment of buying of nickel for the stockpile in the first quarter of 1957 which would free about 12,500 tons additional for industry.

Slow Business in Copper

No immediate improvement in copper buying was in evidence by mid-December and producers appear resigned to slow business until the new year, and they are not over sanguine that it will bounce back then. The plain truth is that present consumption is not sufficient to care for increasing output. True enough, copper sales in November were higher than in October but were under comparable sales in 1955, and are hardly more than 75 per cent of the average in early 1956. If it were not for high activity in the wire and cable division, in contrast with about a 60-70 per cent rate for the brass fabricators, the situation would be worse.

This appears rather plainly in the November statistics for the copper industry. At the end of that month refined stocks had climbed to 116,500 tons, more than double the figure a year ago. Shipments had declined to 114,500 tons, in contrast with

133,800 tons in 1955. The picture abroad was no better, with stocks up 50,000 tons over 1955. The brass fabricators held 440,000 tons at the end of October, an increase of 87,000 tons over 1955, while their unfilled orders had dropped to 198,600 tons from 275,200 tons a year ago.

Government Buying Props Zinc

Record shipments of 27,168 tons to the Government's stockpile in November pushed total deliveries from the smelters to a new monthly total of 110,443 tons. But without such shipments there would have been another substantial increase in producers stocks that would have carried them up to nearly 100,000 tons. They were 38,000 tons a year ago. Sales of High Grade are slow, with demand from die casters still disappointing although a little improvement has been noted recently. Orders from the brass fabricators are small.

Domestic stockpile purchases are believed to have reached the objective of 300,000 tons originally set. The end of Government buying would remove a most important prop under the 13½ cent zinc price. But there are reports that this goal may be extended. It is quite possible that the Office of Defense Mobilization will continue buying domestically mined zinc and lead until some other plan is evolved acceptable to mining interests. This might consist of additional tariff protection, unpalatable as it might be to the Administration.

Aluminum Production at High Record

Primary aluminum production in October rose to nearly 150,000 tons, a near record. No noticeable increase in domestic demand has been seen. Orders from the die casters are still less than expected. Secondary aluminum sellers see some improvement but they could stand a lot more. Sheet business and extrusions are slow, reflecting decline in residential building.

Titanium Prices Reduced

The price of titanium sponge has been reduced to \$2.75 a pound by Du Pont and Titanium Metals. This is the second price reduction in 1956 and the fifth since 1954. Sheet prices are down \$1 a pound, plate 75 cents and some wire sizes \$2. Cost improvements from volume production are cited as reasons for lowering the price, which will result in a \$3 million saving for customers.

Chevrolet's New Engineering Center

(Continued from page 71)

at a time. The very best designs must be obtained early, so that the last dollar of manufacturing cost reduction can be realized and the maximum customer acceptance obtained when the model reaches the public.

The center operates as a staff organization, headed by E. J. Premo, executive assistant, and seven assistant chief engineers. Staff engineers manage their individual assignments, and report to their respective assistant chief engineers. The complete staff group of 25 men meet each Tuesday morning for reports, program planning and decisions for action.

The first of seven major departments is a research and development group assigned to work on complete vehicles and components from two to five years ahead of production date requirements.

Three design groups; passenger car chassis; truck chassis; and body, are working on designs and production releases from one to three years ahead of the production date. The fabrication departments build experimental and prototype vehicles in all stages of program development. The experimental engineering group runs tests in the laboratory, at the proving ground and on various highway road test trips. This group also controls a test fleet of several hundred cars and trucks. Finally, the production engineering group maintains contact with the 30 manufacturing and assembly plants throughout the country, to make certain that the vast production organization of Chevrolet is accurately informed on our engineering specifications and releases.

The building is really three buildings under one roof, totaling over 640,000 sq ft of floor space. The administration building accommodates offices, design rooms, cafeterias and clerical functions necessary to publish and release the miles of blue prints that are run each month.

The experimental building houses a complete fabrication plant for constructing vehicle components and models. It also includes four garages and a design check department. The test laboratory building has the most modern equipment for the detailed physical and dynamic tests necessary to prove the designs before production release.

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Annual Meeting of the ASME

(Continued from page 59)

increased percentage of efficiency. Another feature, following closely the characteristics of the free-wheeling stator-type converter, is the converter which is equipped with a lockout clutch. Here again the converter is used during the high torque-load changing cycles following which the input and output sides of the converter can be clutched together to serve as a straight-through drive. This can be accomplished either with the converter filled or emptied. If the converter is allowed to remain filled, the drag of the elements through the fluid even with a fixed stator will represent only a loss of from five to 10 per cent, but it retains the advantage of being instantaneously available for either type of drive. Where fewer maneuvers permit the emptying and filling of the converter, this loss can be eliminated through the addition of the dumping and filling feature.

A recent addition to the available features on torque converters is the ability to run the converter partially filled. This serves the purpose where speed control is desired beyond the range of that of the prime mover. The conventional torque converter can be brought to stall even at full input speed, but only if the torque load on the output shaft is sufficient. Partial filling can be made to reduce the output-shaft speeds to substantially stall conditions even under light torque loads.

There is a feature for reversing torque converters which can be accomplished in a number of ways at least two of which have been developed already. There currently is available a single-stage torque converter in which turbines are provided for both forward and reverse rotation which are mechanically shifted into and out of the circuit. Some of the original converters developed, incorporated two circuits, one for ahead and one for reverse operations which were put into service by alternately filling and dumping the circuits. Each of these reversing arrangements would have its own set of characteristics and would be adaptable to certain types of usages.

Still another variation of the torque converter, which is definitely possible, but has not yet been exploited, is the ability to make it of high- and lowspeed ratio characteristics. Conventional industrial torque converters have their peak efficiencies at speed ratios of from 0.5 to 0.7, but by altering the blade shapes and number of stages the peak efficiency can be made to appear at most any speed ratio from values as low as 0.1 to as high as 1.0.

Combinations of these features superimposed on the basic characteristics of torque converters have caused torque converters to be considered for applications where in the past they have been completely disregarded.

For example, certain marine drives are now being considered which would incorporate the following features in addition to the normal torque-converter characteristics. They could incorporate a reverse to reduce maintenance incurred by present reversing means. Dumping and filling probably would be required by the reversing means, but also would serve as a disconnect clutch between the prime mover and the propeller. Partial filling would be incorporated to extend propeller-shaft speed control beyond that available from the prime mover. A low ratio might be incorporated to eliminate the speed-reducing element of the conventional drive so as to combine all of a ship's drive function into a single unit.

Other types of applications are many, but some random drives being considered are for rubber mills where the torque variations could well use the torque-converter characteristic, but probably will require either speed or torque control.

Experience with Water-Alcohol Injection on the J47 Engine

M. K. WOLFSON, MANAGER J47-J73 Project

General Electric Co. Evandale Operating Dept.

THE basic requirement for augmenting the thrust of the J47 engines on the B47 airplane was to reduce the take-off roll of the airplane under high gross-weight, take-off roll was necessary so that high gross-load take-offs could be accomplished on existing runways.

Figure 1 shows the substantial reduction in B47 take-off roll requirements as engine-thrust augmentation is increased. In considering all possible methods of augmenting the thrust of the J47 engine, the reheat-type augmentation system was eliminated because of the dry thrust loss

inherent in such a design. The resultant decrease in airplane range could not be tolerated in a bomber application. In considering water-alcohol augmentation, both compressorinlet injection and combustion-chamber injection were considered. Compressor-inlet injection would require less mass flow to accomplish a given augmentation rate, but tests soon indicated that the rates of injection required were high enough to cause serious problems of blade erosion and compressor rubs due to the cooling and shrinking of the compressor casing when the cold water was injected into the inlet. Experimental tests had been conducted with water-alcohol injection in the combustion chambers of J47-GE-13 engines since 1948. As a result of these tests, it was decided that a system such as the one illustrated in Fig. 2 held the maximum potential for application on the B47 airplane.

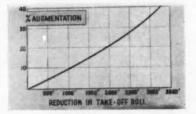


FIG. 1

Per cent augmentation versus take-off distance for a B-47 aircraft

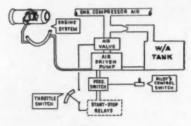


FIG. 2

Basic water-alcohol system components for a G-E J47-25 engine

To obtain immediate relief for the airplane take-off problem, rocket assist was added to the airframe itself. However, the high cost of each rocket-assist take-off served only to add emphasis to the J47 augmentation program.

Injecting the water-alcohol mixture in the combustion chamber increases the mass flow through the fixed-area turbine nozzle and effectively increases the operating pressure ratio of the jet-engine cycle. The upper limit of water-alcohol injection rates is established by the compressor stall-pressure ratio.

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Turboglide Automatic Transmission

(Continued from page 56)

wear. The absence of any automatic shifting eliminates a host of intricate shift timing devices. Sources of oil leaks are practically eliminated since there is only one tapped hole in the case and no covers exposed to oil under pressure.

Because automatic shift provisions are unnecessary, the hydraulic control system is simple. This permits use of a small cast iron valve body with a heat expansion rate nearly equal that of the steel valve spools.

From the standpoint of power flow, the broad ratio coverage is achieved through an ingenious coupling of the turbines to the planetary elements. It is an arrangement that permits a continuous amplification of the ratio change taking place in the converter.

The mechanical connections between the turbines and the planetary

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elements are arranged so that any one of the turbines can drive the output shaft. In a sense, the transmission functions as three separate torque converters, each specializing in a particular kind of performance to effect a smooth transition from the high torque at low speeds to the normal engine torque at high speeds.

The contribution made by each turbine to the total driving torque is determined by vehicle speed and the power output of the engine. The gradual redistribution of the driving load, toward the second and first turbines as acceleration is called for, and toward the second and third turbines as vehicle speed begins to level off, is inherent in the design. No auxiliary sensing devices are required.

The third turbine drives the output shaft by direct mechanical connection through the front and rear planet carriers. The first and second turbines also drive the output shaft, independently of each other, but through gear sets. The first, or starting turbine, drives the output shaft through the rear sun gear and the second turbine through the front ring gear. The reaction members of both gear sets are attached to one-way clutches.

The hill retarder is one of the most important features of Turboglide since it provides a great element of safety. It may be applied at speeds up to 40 mph.

When the hill retarder position is applied, the multiple disk clutch on the rear planetary gearset ring gear is engaged and all other clutches are released. This drives the first turbine at 2.67 times output shaft speed, while the second and third turbines free wheel. The consequent pumping action of the first turbine creates oil flow in the converter, which effectively brakes the vehicle by increasing engine speed and by transferring kinetic energy into heat in the converter oil. The heat is then dissipated by the engine cooling system.

A substantial performance boost results from the dual-pitch stator in the torque converter, reducing the element of compromise through its ability to change blade angle at driver demand.

It is normally in its low angle position, maximum multiplication of 3.8-to-1 occurring at approximately 1700 engine rpm, at full throttle from standstill. However, for the highest torque multiplication, by depressing the accelerator through a detent-type resistance beyond full throttle position, the stator blades are switched hydraulically to the high angle.

(Turn to page 113, please)



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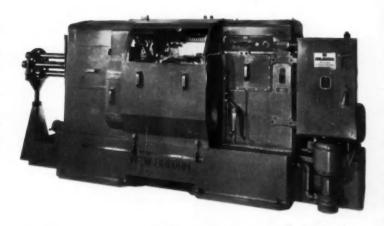
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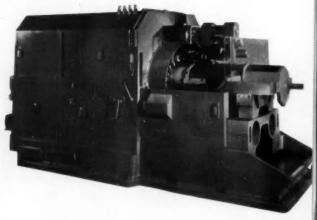


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Determining the Proper Depth of Case in Alloy Steels

In the previous article of this series we discussed the carburizing of alloy steels, pointing out that the purpose of carburizing is to provide a hard, abrasion-resistant outer shell or "case." Such a discussion naturally gives rise to the question, What factors influence the choice of case? Should it be shallow? Medium? Deep or extra-deep?

While it is not always wise to formulate hard-and-fast rules, the following may be used as a general yardstick:

Shallow cases (less than 0.02 in.). Suitable where wear-resistance alone is the chief requirement, and where good surface condition after heat-treating is advantageous. Not suitable if high stresses are apt to be encountered in service.

Medium cases (0.02 to 0.04 in.). For high wear-resistance. Will stand up under substantial service loads and stresses. The thickness is sufficient to permit certain finishing operations, such as light grinding.

Medium-to-deep cases (0.04 to 0.06 in.). For high wear-resistance. A case in this depth range is essential where continuing friction is involved, especially friction of an abrasive or semi-abrasive nature. It is also a good precautionary measure where application of the finished part may sometimes involve crushing action.

Extra-deep cases (more than 0.06 in.). Cases of this depth can be obtained by extending the furnace time in pack carburizing. Highly wear-resistant, they also withstand shock and impact. A large camshaft of an internal-combustion engine is a good example of a part requiring the extra-deep case. This is of course particularly true of the cam lobes themselves.

If you require specific advice concerning case-hardened parts, by all means communicate with our Metallurgical Division. Bethlehem technicians are always on call, and you can depend on their recommendations. And you can depend on Bethlehem, too, when seeking new supplies of alloy steels; for Bethlehem makes the full range of AISI standard grades, as well as special-analysis steels and all carbon grades.

If you would like reprints of this series of advertisements from No. I through No. XVI please write to us, addressing your request to Publications Dept., Bethlehem Steel Company, Bethlehem, Pa. The first 16 subjects in the series are now available in a handy 32-page booklet, and we shall be glad to send you a free copy.

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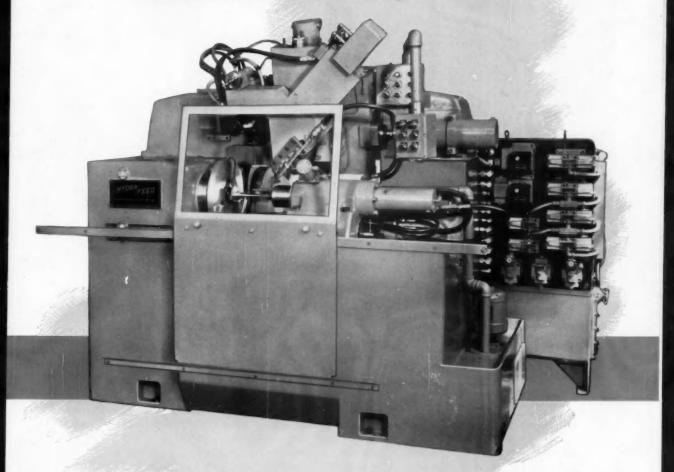
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Chevrolet Turboglide

(Continued from page 106)

Torque multiplication then increases to 4.3-to-1, and engine speed goes up to 2700 rpm.

The variable pitch stator consists of 20 airfoil section extruded aluminum blades arranged radially around a multi-piece hub. Each stator blade is affixed to an individual crank arm. The crank arms serve the dual purpose of holding the blades in assembly and engaging a groove in the pitch control piston, to position each blade positively.

The stator hub is made in two halves, and is split on the centerline of the blade cranks to facilitate assembly. The front half of the stator hub contains the overrunning clutch that permits the stator assembly to freewheel when the coupling phase of converter operation is reached. A cylinder bore in the rear hub half contains the blade angle positioning piston.

Hydraulic control has been greatly simplified as demonstrated in the diagram for the Drive Range—through detent. Elimination of all automatic shifting requirements reduces the function of the hydraulic control circuit to providing oil under pressure for manually controlled clutch applications and stator movements, in addition to maintaining oil pressure and

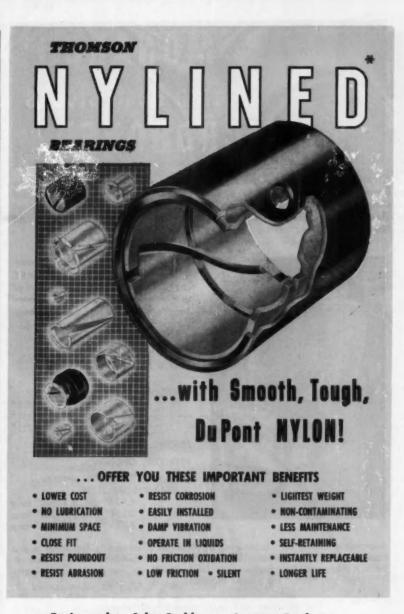
plying oil to one lubrication point.

Oil temperature is controlled by a thermostatic valve, which receives the circulating oil leaving the converter. When the temperature of this oil reaches 180 degrees Fahrenheit the valve completely closes and directs the oil through the heat exchanger incorporated in the bottom tank of the engine cooling system radiator.

circulation in the converter and sup-

To minimize power losses, transmission oil pressure is regulated in proportion to engine torque. A diaphragm exposed to the engine intake manifold vacuum is mechanically connected to a spool valve. This valve modulates oil pressure by varying an opening to the sump, then sending the modulated oil to a pressure regulator valve. Thus, as the engine intake vacuum fluctuates according to power demand, the oil pressure is modulated as necessary to hold the clutches stationary.

There are two oil pumps in the transmission. The larger pump is driven by the engine through the torque converter pump cover, and the smaller pump is driven by the transmission output shaft. With this arrangement, the larger pump supplies



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MONARCH lathe head stocks are MICROHONED

Monarch Machine Tool Company Microhones the spindle bores in its lathe head stocks because Microhoning . . . generates consistent finish, size, and alignment of bores . . . corrects out-of-roundness . . . eliminates cost of line-reaming operations . . . permits interchangeability of spindles and bearings.



And with the use of a new three-diameter Microhoning tool, honing time is reduced approximately 40% over former method which employed two double-diameter tools. One set-up now replaces multiple set-ups previously required.

APPLICATION DATA:

STOCK REMOVAL .003" to .004"

TOLERANCES

FINISH....20-25 microinches

PREVIOUS OPERATION line boring

3 IN-LINE BORE SIZES

4.125" dia. x 1.500" long 5.118" dia. x 1.250" long 6.299" dia. x 5.125" long

Micromatic tooling for Microhoning applications is constantly furnishing manufacturers with cost reductions, higher production and better functional characteristics. A Micromatic Field Engineer will be glad to discuss your production problems and show you "Why" the proper Microhoning tools will help.

The principles and applications of Microhoning are explained in a 30-minute, 16 mm, sound movie, "Progress in Precision"... available at your request.

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MICROMATIC HONE CORP.

oil pressure when the vehicle is standing still or traveling at low speeds, and the smaller pump supplies oil pressure at greater vehicle speeds. The use of a pump on the output shaft also permits the vehicle to be push-started.

Machining Air Frames of the Future

(Continued from page 70)

use of heavy forgings, wherein whole assemblies were forged in one piece and assembled by drilling bolt attachments. Subsequently, the heavy press program was initiated in this country by the Air Force.

By the time the heavy presses became available, the weight problem became critical and it was necessary to remove all the surplus material to save the original performance guarantees. We now find we have defeated our own economy plans by the milling of forgings. At present, up to 70 per cent of the metal in forgings is wasted.

Figure 3 shows a blocker forging and the machine fitting which results from the forging. Figures 4 and 5 show a heavy press spar forging in rough and finished form. Figure 6 shows a titanium forging, rough and machined.

The forging of aluminum alloys is more difficult than steel because of the behaviour of the metal at the forging temperature and because careful die design is required.

Also, because nonferrous metals are much less ductile than steel at forging temperatures, larger forging equipment is required in producing nonferrous forgings than steel forgings of the same volume. Steel is forged near its melting point and is extremely plastic, whereas aluminum alloys are forged at a temperature proportionately much less than the melting point. All of these factors contribute to excess metal in locations not required by stress analysis.

None of the above telerances is suitable for the finished tolerances on forgings for aircraft use because draft, corners, and fillets give inefficient strength distribution for the additional weight factor. In order to use forgings, they must be machined on all surfaces.

Machine tolerances are relatively easy to hold on most operations to ±0.010 in. From a weight standpoint such a tolerance is unsatisfactory. A

machine operator likes to work on the high side of the specified tolerance. Consequently, most machined parts tend to be on the plus side of the calculated weight, which is based on the nominal dimension. This increased weight adversely affects the original performance specifications of the aircraft.

Other difficulties plague the machinist, such as warpage and limitation as to minimum unmachined web thickness. In this connection—just as an example—I think there might be a need for the development of a cutter that will cut both sides of a flange simultaneously. This, at least, might make a good area for the machining experts to explore.

Recognizing the problems of machining, Convair is investigating the possibility of machining forgings and other parts to an overall dimension somewhat larger than that specified, and then chemical milling them all over to the blueprint dimensions. This may eliminate some of the warpage problem, and it does remove the limitation on minimum web thickness.

Conclusions

Simplification is dear to the heart of machine tool builders. But they don't always find it possible to sell single-purpose equipment to airframe manufacturers because the aircraft industry—like other industries—desires to apply equipment to more than one task.

Long-range planning is necessary in the machine tool industry. To a large extent, what Convair has in the F-102 in the way of materials and machining methods will be present in the F-106 interceptor and even in the 880, the medium-range jet transport which we plan to have in production by 1960.

Figure 7 shows how the chemical milling process can help us. The leading edge of an F-106 takes about 60 minutes to etch. Machining that part would require about four hours.

The situation boils down to this: Materials and machining will be virtually unchanged for the 880 jet transport because there is no alternative—because the machine tooler's lead-time is as long as the aircraft designer's.

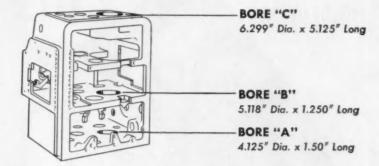
But when we reach the stage of building airplanes for Mach 3 and 4 speeds, there will be drastic changes. New materials will be necessary, and with them, new tooling methods. The machine tool builders need to be planning now for that time.

Exactly what will be necessary

MONARCH MICROHONES three bore diameters

Using a three-diameter tool and only one set-up, Monarch Machine Tool Company Microhones three in-line bores in lathe head stocks. Bore diameters are 4.125", 5.118" and 6.299". Stroke of Microhoning tool is changed only once during the working of all three bores. Former method of honing required multiple tooling and set-up.

How Monarch Microhones:



FIRST STROKE SETTING

Bore "A" is Microhoned while guiding on Bore "B" Bore "B" is Microhoned while guiding on Bore "A"

SECOND STROKE SETTING

Bore "C" is Microhoned while guiding on Bore "B"

How This Microhone Tool Operates:

A compound cone in the tool allows any one of the three bores to be Microhoned by expanding or collapsing individual banks of stones and guides. A selector sleeve shifts the cone rod to provide positive control of abrasives and guides.

Micromatic "How" knowledge, obtained through 27 years of experience in designing, engineering and manufacturing of Microhoning equipment for all types of applications throughout the world, can solve your production honing problems.

Learn how Microhoning will give yo closer tolerances, accurate alignmen Please have a Micromatic Field Please send Micromatic literatur NAME	nt and functional surfaces. Engineer call.	000000	Office of the Contract of the
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- SMALL SIZE
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Power Output:

2 watts

Weight:

1.7 pounds

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would be impossible to say now. There is disagreement among even design engineers as to whether fighter airplanes will become smaller or larger, whether wings will become stubby, solid-metal affairs or will disappear altogether.

The Aircraft Research and Testing Committee of the Aircraft Industries Association recently completed a survey of leading airframe manufacturers to determine the big needs in research over the next 10 years.

Looking ahead 10 years, the report said that high strength cermet development should be emphasized as a possibility for a structural material.

It pointed out that design temperatures will possibly see a ceiling of 3500 F. At that temperature, most presently known materials will be inoperable and design philosophy will change from the improvement of materials to the protection of materials. Protective coatings and forced cooling will become the order of the day. And these new cooling systems will involve the development of such items as porous metals for evaporative cooling and hollow sections for coolant fluids.

The foregoing article is an abstract of a paper presented by the author at a conference held by the True Trace Co.

AUTOMATION News Report

(Continued from page 72)

valves which control the machine table or cross slide.

Although the Numill system was originally designed to produce templates profile bars, profile mill fixtures, and other two dimensionally defined parts required in aircraft manufacture, it is new being used to turn out small-lot aircraft parts.

At Northrop Aircraft, Inc., a huge riveting machine, known as the Drivmatic, automatically drives fuel-tight alug rivets in a wing section at the rate of seven rivets per minute. The Drivmatic riveter can "button up" a wing section 20 ft in length in about one fourth the time it takes to do the same job manually. The entire operation once required five men. Now two men can set up the machine for an indefinite run, and only one operator is needed to turn out the wing sections.

The controls consist of three boxes,

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each of which contains an opaque punched tape, a small bright light, and a photoelectric cell. When the light passes through the punched holes, which represent data to guide the machine, the light-sensitive cells are activated to deliver signals to an electronic brain. The brain activates three driving mechanisms: a motor-driven system, which raises and lowers the carriage of the Drivmatic riveter; reversible motors, which move the carriage transversely; and a hydraulic system for longitudinal travel. The punched tape which actuates longitudinal motion also guides the tools that drill, ream, and countersink holes.

DO-IT-YOURSELF AUTOMATION

More than 180 manufacturers showed new and established automation products at the Third International Automation Exposition which was held in New York recently. Devices ranged from digital and analogue computers that simplify bookkeeping, filing, and other office work to electronic control systems that guide factory production without the use of human hands.

Of special interest to owners of small and medium-sized plants was

a new line of electronic gaging and control equipment shown by Airborne Instruments Laboratory, Inc. Designed to apply automation to standard machine tools, the Microtrol units, as they are called, will boost the output of machines such as grinders, lathes, and planers. And it will do this, according to the maker, at a small percentage of the cost of new equipment.

The user does not have to be an expert in automatic control theory to install the Microtrol units. In line with its do-it-yourself approach, Airborne Instruments has designed each unit as a separate package that is self-sufficient except for the electrical connections (mostly of the plug-in type) that tie it in with the other units. All the user has to do is select the right combination of Microtrol units for his particular job and add the necessary mechanical components to complete the setup.

The complete Microtrol line includes electronic measuring units that gather information and send out signals to initiate action; gage heads that receive and transmit data to the measuring units; and a large number of electrical and mechanical accessories that adapt the gage heads and indicating units to a wide variety of applications.

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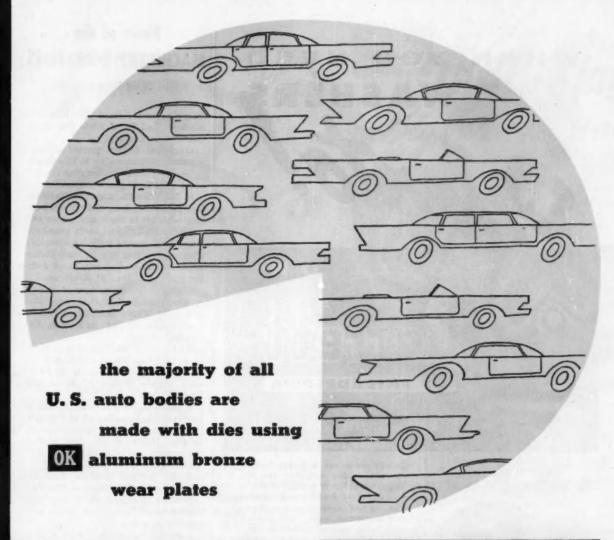
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News of the MACHINERY INDUSTRIES

(Continued from page 79)

Tool Co. and formed the Bradford Machine Tool Co. of Mich. with headquarters in Lansing.

Cincinnati Shaper started expanding its Whitewater shop in Cincinnati.
Snyder Tool & Engineering Co. finished a \$600,000 plant expansion.

E. W. Bliss Co. acquired Matteson Equipment Co., Inc., and obtained exclusive rights to the manufacture and sale of fully-crowned-tooth gear-type couplings formerly made by American Flexible Coupling Div. of Zurn Industries, Inc. Bliss also purchased John Robertson Co., Inc., of Brooklyn.

Michigan Tool Co. formed a new division called Gear-O-Mation. Illinois Tool Works established Illinois Tool-Shakeproof Ltd., in London, England.

Norton Co. opened up a west coast plant in Santa Clara, Calif., and obtained a controlling interest in Abrasivos Irmaos Meyer, S. A. of Sao Paulo, Brazil.

Warner & Swasey mapped out a program for an outlay of \$5.8 million for expansion and modernization. Shortly afterward, the firm started the first of two additions to its New Philadelphia, Ohio, plant.

R. K. LeBlond Machine Tool Co. bought out Fosdick Machine Tool Co.

Overton Gear and Tool Corp. was formed in Addison, Ill., to make spur and helical gears.

National Automatic Tool Co., Inc., completed a program of increasing its sales force by 75 per cent. It opened 12 new district offices.

Michigan Drill Head Co. completed a major sales expansion to blanket the U. S.

Brown & Sharpe Mfg. Co. and Nelco Tool Co., Inc., teamed up to combine sales operations. B&S split into two divisions—Machine Tool and Industrial Products, and completely reorganized its management structure.

Jones & Lamson Machine Cobought out Modern Tool Workers' inventory work-in-process, tradenames, and designs.

Cone Automatic Machine Co., Inc., took over the manufacturing and sales rights of the H.E.B. Pilot lathe for the U.S. and Canada under agreement with H. Ernault Batignolles of France.

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Federal excise taxes on new cars and trucks are too high and should be reduced, motor vehicle manufacturers tell a congressional group studying tax matter. They place the tax portion of the cost of a car retailing at about \$2000 at more than \$500, \$146 of which is the amount of the Federal excise.

Plant and equipment expenditures of business are expected to advance to a new high in the first quarter of 1957. Expansion programs are scheduled at a seasonally adjusted annual rate of about \$38 billion in the first three months of the year.



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Eddy Elected SAE President; Annual Meeting Program Set

W. Paul Eddy, chief of engineering operations at the Pratt & Whitney Aircraft Div. of United Aircraft Corp., has been elected president of the Society of Automotive Engineers for 1957. He will be one of the featured speakers at the S&E Annual Meeting in Detroit Jan. 14 through 18.

The meeting agenda includes such topics as nuclear energy, fuel injection, design features of 1957 cars, operating problems, aircraft, etc. There will also be a display of automotive products.

1957 Buick Production

(Continued from page 66)

The several press shops in this area also show unmistakably the impact of new methods and new equipment. In one section there is an installation of some 10 of the latest type Henry & Wright dieing machines with air cushions mounted on upper cross head. They are tooled for a large variety of

small stampings of heavy section made from coil stock. An interesting feature of the setup is the adoption of coil reels and straighteners of unique design, supplied by Sesco, Inc. A feature of the Sesco reel is an adjustable arbor that can take coils of 15-in. ID to 28-in. ID.

These big dieing machines are capable of producing at a rate of 50 strokes per minute, and will handle stock 0.150 in. thick x 78 in. wide with a maximum feed stroke of 12-in.

One of the prize exhibits in the press shop is an experimental production setup—a very compact one indeed, as the illustration shows—for producing stator rings from strip. The completed stator ring has an inverted Tee-section with the leg of the Tee giving the appearance of a heavy rib on the outer periphery.

The equipment is arranged in the form of a U. The operation starts on the right hand side with the feeding of strip in coil form from a Sesco reel into Sesco



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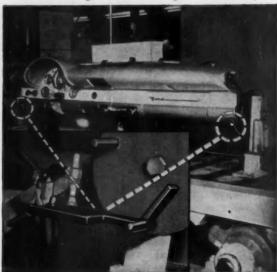
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Chem-o-sol coating in this case was applied in the plant by a very simple dipping process. Had the parts been too bulky to dip, spray chem-o-sol would have been equally satisfactory for in-plant application.

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GARAGE & REPAIR, No. WEST IOWA. Complete auto, repair service. Good location & well equipped. Ill health. Dept. 62109. CHAS. FORD & ASSO. INC., 6425 Hollywood Blvd., Los Angeles, Calif. straightening rolls. At the end of the roll section the strip is cut off into strips of proper length. These strips then enter a station in which they are rolled into full circle.

From this station the individual circular pieces are loaded onto the big mandrel which feeds to the welding head. Here they are moved by means of dogs progressively into the seam welding station of the National welding machine. As the weld is completed, the mandrel moves each piece into the Niagara press at the left for trimming.

Following trimming, the work is moved to the special machine at the left of the press where it is sized and swaged to produce the Tee-section. The finished rings then come out of this head, drop onto a short flight conveyor which carries them into a press for piercing a series of holes in the flanges on each side of the rib.

It may be noted that the entire operation is fully automatic and continuous from start to finish and occurs at a much faster rate than does this word description.

The press shop is rapidly shaping up into one of the most modern equipment and process installations in the industry. Automatic loading and unloading devices, including the Sahlin mechanical hands, are found on all lines. Not only does this serve to better organize the flow of stampings, it also eliminates the manual handling of blanks and stampings, thereby removing the hazards that were associated with heavy press operations only a short time ago.

Coming soon is one of the most modern installations of continuous blanking of fender and hood sheet metal. One of its major features will be an enormous double-end McKay reel capable of handling coils of 96-in. sheet. The coils will progress through a McKay straightener, a washing machine, and finally through the enormous 96 x 208-in. bed blanking press.

Another innovation is the installation of the Sheffield Press-Pacer, a new type of automatic transfer mechanism for large transfer presses.



WHAT ARE SCHWEPPE STUDS?

They are double-ended studs made with dual thread-cutting slots at the lower end. Final threads on this end develop a positive frictional interference locking action on entering the hole.

HOW ARE THEY DRIVEN?

Schweppe Studs can be driven in an inexpensive drilled hole with any power stud driver. In one simple, continuous operation, they cut their own thread, drive, lock and seal.

WHAT ARE THEIR ADVANTAGES?

The self-tapping feature eliminates tapping time and thread inspection, tap wear and replacement, tap breakage and salvage time. The self-locking action of Schweppe Studs prevents loosening or backing out, even under extreme conditions.

WHAT ABOUT AUTOMATION?

Since Schweppe Studs may be located accurately from the slotted end, they can be "hopperized" for automatic feeding and driving.

To fit many applications, Pheoll Schweppe Studs can be furnished in a broad range of metals, finishes, sizes and thread styles. Learn how you can profit... find out about the many advantages...

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covering the issues from January 1 to June 15 and from July 1 to December 15, 1955, inclusive and from January 1 to June 15, 1956, inclusive

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PLUG VALVE of Geon for handling corrosive fluids demonstrates molding of complicated shapes with integral threads. At the bearing surfaces Geon is molded to another plastic.

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All parts shown made by Tube Turns Plastics, Inc.

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BIG FELLOWS include piping tee and motor bonsing, requiring beavy cross section, chemical inertness, dimensional stability. By contrast, molding for automobile dashboard has thin section, large projected area.



ELECTRICAL PARTS include fractional borsepower motor bousing which reduces appliance weight, and hanger band for transformer with Geom molded around metal bolt. Geon has excellent dielectric properties.



AUTO HORN trumpet shows complicated contours possible in rigid Geon. Note very thin walls obtained in this high-impact material. Photos courtesy Tube Turns Plastics, Inc., Louisville, Ky.



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TOP RING SECTION



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- 25% aluminum bearing area for heat conductivity and cool operation.
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